TELEPHONE ENGINEER

Vol. VII CHICAGO, FEBRUARY, 1912 No. 2

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CHICAGO, FEBRUARY, 1912.

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THE NATIONAL CONVENTION.

THE fifteenth annual convention of the National Independent Telephone Association will be held in Chicago, at the Hotel Sherman, February 7, 8 and 9. It will be held in a city that now has, for its first time, a well-established independent telephone system. Chicago has changed, since the last convention, from a Bell island in an independent sea to a strategic independent stronghold, a port for commerce with all other independent points. In this the Independent Association has gained one of its most important contentions.

At the hour this issue of TELEPHONE ENGINEER went to press, the details of the convention program had not been worked out. But it is sufficient to say that important measures, affecting the business of every independent operator, will be discussed. Some of the past year's events will be explained by operators who participated in them. Those who think business at home is too important and engrossing to spare them for the three days at Chicago should reconsider. One per cent of the time you put in each year on your own problems is a small tax for the help of all your fellow operators.

Every year the technical conference becomes a more important feature of the National convention. Some, indeed, have come to regard it as the main function of the annual meeting, with the political discussions and committee reports as incidental attractions. This year several new subjects, or new phases of old subjects, demand attention. There have been great developments in commission regulation, and a number of states have established public utility commissions within the year. Precedents have been established, lines drawn, decisions handed down that are of vital moment to the telephone operator. The association has compulsory physical connection as a new platform; for its directors did not endorse that policy until March 14, 1911, over a month after the last convention. It will be remembered that in spite of the efforts of Frank H. Woods, Theodore Gary, and others, the convention refused to take a step so seemingly radical as advocating relations with the "common enemy," the Bell. So the directors, subsequently took the matter into their own hands; and the fact that Bell policy is antagonistic to physical connection with independent lines has only proven its soundness as an independent doctrine.

The annual independent convention is a great Telephone Show. It compares with the automobile shows, the electrical shows and the business shows that are being held in greater numbers each year. The only difference is that the telephone show is without

admission price—it is free to all who are interested. Without a doubt, the exhibits of manufacturers—on some of which an extraordinary amount of time, care and money are spent—form one of the most attractive features of the meeting. Here every man may witness with his own eyes the operation of that new cord circuit, or line signal, or lightning arrester, or fire extinguisher, or long-distance transmitter, or tree trimmer, or what not. He may test wires and batteries and ringing machines and testing devices to his heart's content. He may carry home enough literature to keep him busy evenings for a long time. He may even place his orders for those supplies which he is bound to need this year, and with all the advantages of seeing just what he is buying.

Every convention promises to be the biggest ever held; but there is good reason to believe the promise of 1912 is not an idle nor an over-optimistic one. Some states are sending their delegates by the carload.

In spite of the mergers and combinations of the year, independent telephony is stronger now than ever. The chief indication of that truth is the opposition's policy of co-operation rather than destruction. One can start a war, but it takes two to make terms. Independent strength has always been in association, and the tie that binds the association is the annual convention. Do not neglect it!

THE PUBLIC'S ATTITUDE.

PUBLIC relations is a subject just now prolific of discussion. It is generally agreed among corporation officials that the day is past when those relations can be strained with impunity, and that every effort should be made to preserve the *entente cordiale* which is so hardly attained. And the difficulty of gaining public confidence is a direct consequence of ancient disregard for public opinion.

That this distrust, though perhaps quiescent, still exists is known to all public utility representatives whose work brings them into contact with the people. In fact, the only ones likely to forget or overlook it are those whose scrupulous observance of modern rules of public relation has given them a pleasant sense of security and confidence. Like a lucky theater manager who has never encountered an emergency and therefore knows nothing of the beast in man as a panic reveals him, these exemplary public servants who have always striven to please the people know nothing of the effects of displeasing them until they stumble on them accidentally.

The Chicago Telephone Company has been subjected by the city of Chicago to the annoyance of three successive expert investigations, with no guarantee that more may not follow. The several experts found little common ground; but one of the points of agreemen was the unprofitableness of the four party residence nickel coin service. It being obviously impracticable to increase the rate per call in this type of service, the telephone company undertook to eliminate some of the interior causes for its inefficiency. In the existing system, the subscriber dropped the coin when requested to do so by the operater, after calling the number. This resulted in disputes as to whether the coin had been deposited, delays while the subscriber held the line and hunted for a nickel, and numerous calls for credit on account of prematurely dropped coins. It was proposed to substitute the "nickel first" system. With this arrangement the subscriber is unable to get the operator until a nickel has been deposited. This, in addition to overcoming the difficulties noted in connection with the former system, saves the time required for the operator to pronounce the five syllables, "Drop a nickel, please."

The nickel first service is really an admirable arrangement. Its savings are direct and obvious. Its users are certain to benefit by these savings in improved service, especially where the company is under the regulating influence of either legislation or competition; and Chicago has both. The only objections advanced against it were that emergencies might find the subscriber without the requisite nickel, and that a nickel accidentally dropped by the operator could not be regained or credited without using another nickel. These arguments are rather weakened, however, by the fact that slugs which may be substituted for nickels are sold very cheap—and indeed the telephone company has furnished all its nickel first subscribers with a few of these slugs for emergency use. So the objections were not really serious, and without a doubt the public would have accepted the change with good grace if the matter had been handled differently.

Corporations are often accused of ultra-conservatism in the matter of adopting new methods. But it is really the public which resents any suggestion of radical change. The old suspicion flames up as soon as anything new is proposed. If the change is sweeping and sudden the public confidence that has taken years to build up may be lost in a day.

The Chicago Telephone Company was able to show the Chicago council committee that the nickel first idea was not unreasonable. The committee agreed to allow the installation of the new service, provided the change was made only after the subscriber's consent had been secured. The provision was clear.

Friday, January 12, a large number of subscribers received notice from the telephone company that their service would be changed at once unless objections in writing were received at the company's office before the close of business on Saturday, the 13th. We do not know how many protests were filed within the requisite time, or how many were mailed too late, or how many remained unexpressed, to germinate resentment against the company.

Perhaps the council committee was already unduly prejudiced against the company. At any rate, the latter's action in rushing the service alteration was not calculated to mollify the committeemen. Charges of breach of faith and high-handed methods were freely made. The result has been the drafting of new ordinances intended to prohibit the company from using the new service except where a subscriber expressly requests it. Here are the ordinances:

> No person, firm or corporation furnishing telephone service from any point within the City of Chicago by means of telephone instruments equipped with a coin box or slot or similar device for receiving 5-cent pieces or nickels shall exact, demand or require that a 5-cent piece, nickel or other coin or slug or token be deposited in such instrument, coin box, slot or device for receiving 5-cent pieces or nickels, before the person using the telephone instrument is placed in connection with an operator of such person, firm or corporation furnishing such telephone service.

The other ordinance is in the form of an amend-

ment to the telephone ordinances adopted by the council in 1907 and reads as follows:

Nickel prepayment service shall be supplied by said Chicago Telephone Company by means of telephone instruments equipped with a coin box or similar device for receiving five-cent pieces, and excepting cases where the lessees, subscribers or patrons of said Chicago Telephone Company shall expressly consent thereto, such telephone instruments and coin box and slot or similar device for receiving five-cent pieces shall not be of such mechanical construction or operation as to require the deposit of a coin or slug, or token therein, or in any part thereof, before the person using the telephone instrument may communicate with an operator of said Chicago Telephone Company.

Each ordinance provides a fine of from $25 to $200 for each violation. The ordinances were referred to the committee, as requested by Mayor Harrison; and the committee has deferred action on them, because the telephone company has promised to produce an improvement which would satisfy both the subscribers and the committee. The improvement is presumed to be a subscriber's meter.

In the meantime the committee, which appears to have had some doubts on the real merits of the volume of protests it has received from the public, is advertising for opinions—taking a straw vote on the subject, so to speak. The results of that test will largely determine the city's further action in the matter—for it is up to the people to decide, however the telephone company may view it.

The company has doubtless discovered by this time that its unseemly haste is apt to result expensively. It will be many a year before it can institute any more changes without having its motives questioned and its methods subjected to minute inspection—a condition as embarrassing to a corporation as to an individual.

This is a matter of public relations. The Chicago Telephone Company's *faux pas* was due to ignorance of the principles of public relations or a disregard for those principles. The nickel first telephone is all right. The company's motive in installing it was all right. The misstep occurred when the company disregarded the council's injunction and shifted the burden to its subscribers. The ridiculously short period allowed for protest may have been due to an error; but such errors should not occur.

The nickel first incident in Chicago is a good example of how public relations should not be handled.

TRANSMISSION EQUIVALENTS.

CONTINUING in this issue is the report on the efficiency of copper clad steel wire in telephone service. The previous installments in our December and January issues dealt largely with the preliminary questions leading up to the calculation of final efficiency or what telephone engineers have been pleased to term "transmission equivalents." These equivalents are presented in this installment and will be of special interest to engineers, both for their intrinsic value and for the presentation of the method for their determination.

The discussion of the inductance of copper clad wires is one of the principal features in determining the line constants of this material and calculating its attenuation constants. The inductance, and, in turn, the inductive reactance, of a copper clad circuit is much less simply found than in the parallel case involving wires of any homogeneous material, such as copper or iron. The case of copper is the simplest of all, because it is a non-magnetic material, while the use of iron brings in certain difficulties owing to the unequal distribution of the magnetizing force within the wire and the attendant variations in permeability.

But the inductance of a copper clad circuit is theoretically divisible into three parts. The first comprises the air circuit, which is wholly outside of the wires themselves. The next consists of the copper shell surrounding the steel core of each wire, and the last is comprised of the steel cores themselves. That part of the inductance which is internal to the wires, embracing the second and third parts just named, depends upon the relative areas of copper and steel in the cross-section and their respective positions, also upon the conductivity of the steel and, furthermore, upon its permeability. The actual determinations of permeability were apparently made with great care and with the highest degree of precision that might be expected in such work. There seems to be no room for reasonable doubt on that point.

Not quite the same degree of painstaking was expended in arriving at the relative cross-sectional areas of copper and steel and the relative conductivity of the steel. No serious degree of doubt is thereby cast on the results, because, as will appear in the next installment, they have been closely checked at one representative point by an actual test of a copper clad aerial line something over 100 miles long. But it may aid in obtaining a grasp of the whole subject to discuss this feature of it briefly.

An examination of expression (12)* for the inductance of a copper clad steel wire will show the several independent variables which enter into the function. The radius of the steel core and the outside radius of the wire depend upon the relative areas of copper and steel, which in turn depend upon the ratio of the total conductance to the conductance of a solid copper wire of equal size. The latter ratio is within the manufacturer's control to a very large extent, but some variation is unavoidable. Thus the area of steel, assuming it to have 12 per cent relative conductivity, necessary for a copper clad wire whose total conductance is to be 40 per cent of solid copper, will have to be 68 per cent, leaving 32 per cent of copper area. A 47 per cent wire, with the same kind of steel, will have 60 per cent of steel area and 40 per cent of copper area. The assumptions have been made in the report that the steel area is 60 per cent and the relative conductivity of the steel 12.1 per cent. This assumption as to area is probably a fair average between the regular 40 per cent grade and the special 47 per cent grade, being a little low for the former and high for the latter, because the commercial wire will probably exceed its conductivity rating by a small margin.

The best procedure in such cases, to avoid all doubt, is to polish and etch a cross-section of wire, and then photograph it through a microscope when magnified to a diameter of several inches. The planimetered areas of such a photomicrograph will furnish the relative areas of copper and steel, with very fair precision.

The conductivity of steel varies to a great extent with its composition and treatment, and about the only way to be sure of its value in the present instance would be to remove the copper shell of a cop-

*See TELEPHONE ENGINEER, issue of January, 1912, page 37.

per clad wire, for a length of a few feet, and measure the resistance, length and volume of the steel core, to ascertain its conductivity. The steel used in the core, in the billet form, has a resistance which is probably not less than seven times that of copper, or a conductivity not in excess of 14 per cent. There is reason for expecting that this conductivity decreases as the steel passes through the process of wire making, due to the working and hardening of the metal. The fact that it was not directly determined in the present instance leaves the matter open to some doubt. However, an error of considerable magnitude here would produce a much smaller and perhaps wholly negligible effect on the calculated transmission equivalents.

Our attention has been directed to the fact that the attenuation constant for standard cable, given in the report** as O. 103, was calculated for a periodicity of 750 cycles per second instead of 800 as stated. This means that formula (6) should be changed very slightly, as follows:

$$l = \frac{0.1056 \times 32}{a}$$

It follows that all of the calculated transmission equivalents are 2.5 per cent low, because the attenuation constant for standard cable at 800 cycles is 0.1056 instead of 0.103; the results are not impaired at all for comparative purposes and the magnitude of the error in absolute values is less than the probable error in an ordinary comparative transmission test.

The term standard cable is constantly met with in transmission work and by common consent this has always meant a paper insulated cable, with twisted metallic pairs, of No. 19 B. & S. gauge. But unfortunately the mutual electrostatic capacity between the wires of a pair has not always been standardized at the same constant value, even by the Bell engineers in this country. In the present instance the standard is a cable whose loop resistance is 86 ohms per mile, loop inductance 0.001 henry per mile and mutual capacity 0.055 microfarad per mile. This will enable those who wish to compare the transmission equivalents in the report, with the results of other tests or calculations, to do so readily.

CANADIAN PACIFIC TELEPHONES.

SOME ingenious enemy of railway telephones managed to get a paragraph into some of the newspapers last month to the effect that the Canadian Pacific Railroad had discontinued the use of telephones for train dispatching, and returned to the telegraph.

The Canadian Pacific is one of the largest railroad companies in the world. Since the first activities in railway telephones it has been one of the strongest advocates of the new method of dispatching. A report of early 1911 shows that it had at the end of 1910 over two thousand miles of telephone dispatching circuits in use, and it has added more since then. The newspaper report referred to above was obviously "important if true."

F. T. Jennings is superintendent of telegraph of the Canadian Pacific. We quoted to Mr. Jennings the substance of the newspaper clipping and asked him for a statement as to its truth, and the reasons for the action if it was true. And Mr. Jennings says: "Nothing in it. This company is adding telephone mileage continually and finds its operation immensely successful." Evidently some disgruntled telegraph operator was the source of the misinformation printed by the newspapers, which was accepted by them as authoritative without proper inquiry.

New as it is comparatively, the dispatching telephone has had an unusually thorough tryout, and has come through its period of probation in triumph. Its rejection for inefficiency now would demand investigation, for it is scarcely possible to find weaknesses in the system that have not already been considered and overcome. Further developments in railway telephony must surely be along the line of improvement and increased efficiency and reliability. In fewer words, railway telephony has arrived. It is no longer an innovation—it is established as a part of the great American railroad scheme. The telegraph must take a back seat. It has become subsidiary to its former vassal.

**See Telephone Engineer, issue of December, 1911, page 328.

GOVERNMENT HAS BRITISH TELEPHONES.

The transfer of the National Telephone Company of England to the British Post Office took place without in any way affecting the existing service or organization of the business, except as regards the head officials, to the number of eleven. The transaction involved the transfer of 1,578 exchanges, and 549,976 stations, served by 18,000 employees. A sum of $15,000,000 is to be paid to the company on account. The postmaster general addressed a letter of welcome to the employees pointing out the advantages they would derive from the change, and expressing his intention to secure equality of treatment between transferred and existing officers so far as was possible. A valedictory letter was also issued by G. Franklin to the company's staff, commending the zeal and fidelity of the employees and their loyalty to the board of directors, and offering them his personal thanks and sincere wishes for their prosperity in the service of the state.

A meeting of the company took place January 9 to pass the necessary resolutions for the liquidation of the concern and the payment of the debentureholders, followed by an extraordinary general meeting to appoint Mr. Franklin liquidator, and to continue the powers of the directors in dealing with the purchase by the postoffice. The inventory of the company's assets, which has been in progress for many months, is approaching completion, and it is expected that the company's statement of claim will be presented to the postmaster general early this year. Almost certainly the matter will have to be taken before the Railway and Canal Commission for the final settlement of terms.

At a meeting of the Glasgow employees of the company, a resolution was passed protesting against the conditions of service under the classification proposed by the postmaster general.

SAVED BY A MINE TELEPHONE.

A mine telephone required by a state law recently passed in Kansas probably saved the lives of J. K. Keeran and William Martin, shot firers, employed in a mine near Pittsburg, Kansas. The men were cut off from the entry shaft by a gas explosion. They telephoned their location to the top. A rescue party found both unconscious, almost suffocated. They were carried to the top and revived.

Northwestern Cedarmen's Convention

Sixteenth Annual Meeting

THE Northwestern Cedarmen's Association held its sixteenth annual convention at the West Hotel, St. Paul, beginning January 23, President T. M. Partridge presiding.

The convention was well attended by producers from Minnesota, Wisconsin and Northern Michigan, and steps taken with a view to increasing the membership promise to result in advantage to the association. The constitution was amended, admitting to membership producers of ties and pulpwood, thus avoiding the possible organization of a new association to meet the wants of those engaged in the business of the manufacture of ties and pulpwood, which has become an important one in the north.

Thomas P. Bradley, the New President.

As another means of increasing the membership a plan of interinsurance was proposed which it is believed will not only give members a lower rate than now charged by the stock companies, but will also have a tendency to reduce the present rates of the stock companies.

The meeting was opened with roll-call, followed by the reading of the minutes of the last meeting, after which came the president's annual address. President Partridge said in part:

At our last annual convention I called your attention to a number of important matters that the association should take in hand with a view to early relief. The matter of fire insurance, which is of the utmost importance to us all, was considered by both the Legislative and Insurance committees, the Legislative committee with a view to inserting a statutory clause in policies providing a minimum of sixty days' notice before a policy could be cancelled at the volition of the underwriter. In this we failed for reasons which Mr. Hill of the Legislative committee will advise you later, and as a matter of fact, most of us in Minnesota were glad to get insurance at all. The heavy losses of 1910 and the unprofitable experiences of the underwriters during that year made them a little "gun shy" of risks of our nature. In this they were not warranted, as the experience of many years previous to the dry season of 1910 and also the experience of the past season will amply bear witness. (Differing from the Cedarmen, the insurance companies want to show a good profit every year.)

In reference to insurance rates and a means for relief, we will later hear from Mr. Clark, the chairman of the Insurance Committee.

In the matter of prevention of forest fires, on which subject there was every promise of drastic action by our legislature last winter, we, with the assistance of the lumbermen, headed off the most objectionable features and took the best bill we could get which in effect is as follows:

Where and whenever in the judgment of the state forester there is or may be danger of starting and spreading of fires from slashings, the state forester will notify the parties cutting the timber, ordering them to dispose of slashings as he may direct. Where conditions do not permit burning over the entire area, the state forester may require a safe fire line to be established around such area, the character and width of same to be satisfactory to him. Any person failing to comply with the instructions of the state forester shall be deemed guilty of a misdemeanor and on conviction shall be punished by a fine of not less than $50 and not more than $100 for each violation or failure to comply.

When slashings are left unburned, contrary to instructions, the state forester may go on the premises with a sufficient force of men and burn same and the expense will be a lien upon the land on which slashings are situated, and collectable same as taxes, and shall be a prima facie valid claim that may be collected from corporation, firm or individual who cut the timber.

The workingmen's compensation act, which was the most threatening piece of legislation which ever confronted the employer of labor, died a natural death, the leigslature having adjourned by limitation before action had been taken. This matter, however, must not be lost sight of, as it will come to life again at the next meeting of our legislature.

The employer's liability act, however, was amended, from $5,000 to $7,500. This in turn affects our liability rates and in case your policies have not been amended, it behooves you to give the matter attention at once, as all old policies in this state call for a maximum of $5,000 for one single death and $10,000 for two deaths. The casualty companies have not been very energetic in notifying policy holders of this new condition, as it invariably reopens the much-mooted question of rates.

I believe this association should again take up the matter of allowance for stakes and supports in the equipment of flat cars which is made by the railroads, to the shippers of poles. As you all know, we now are entitled to an allowance of 500 pounds per car. The demands of the carriers, however, are getting more and more rigid, and as the matter now stands, any railroad can refuse to accept from a shipper or any connecting line can refuse to accept from a connecting line any individual flat car load of poles that is not provided with six six-inch hardwood stakes on each side of car, making a total of twelve stakes, and each set of stakes wired both in the middle and top of car with ten strands of one-eighth inch wire or about 1,100 feet of wire for each car. This means about sixty pounds of wire, so that the cost of material at low estimate is $2.00 per car, saying nothing of labor and the weight of stakes not far from 1,200 pounds.

Announcement has been made by the Interstate Commerce Commission that a hearing will begin on January 29 on the question of substitution of tonnage in transit. Those of us who enjoy concentrating and milling in transit privileges must look out for this. It is alleged that following the granting of this concession to milling interests, other industries obtained the privilege and various abuses, it is charged, have appeared. I do not know who the complainant is, or who the action is aimed at. It is certain, however, that the

Cedarmen are innocent and we must not allow ourselves to suffer for the guilty without being heard. This, no doubt, will have strong bearing on some concentrating arrangements.

Matters of this nature, however, should be left to the coming administration.

More closely pertaining to the association itself, allow me to say that it can be made of vastly more benefit to us. I believe the best means to accomplish this is to enlarge its scope. We must have a larger membership. Our reports are very interesting and very instructive, but they can be made more so if we are able to include the largest possible percentage of the total production. It has also been suggested that we include a tie and pulpwood department. So far as ties are concerned, I can see no difficult problem to oppose our handling them as we do poles and, no doubt, with very beneficial results. As matters now stand, the railroads collect their own data, make their own prices and conditions, without respect to the producer or jobber. There is room for improvement here, and I sincerely hope the association will see fit to adopt this proposition.

Pulpwood, I believe, presents more serious obstacles to prevent the realization of any tangible results. However, they are not entirely insurmountable, and I trust you can conceive a plan for its adoption.

It is a gratifying and favorable business omen for the year 1912 that confidence is the keynote of all expressed opinion of our big factors in "big business," heavy financial interests and real captains of industry. The gloom and uncertainty of a few months past is gradually being dispelled. The worst is over, and we are on the up-grade to a period of improved business canditions. Let us all unite in putting our shoulder to the wheel, boost this improved business idea and join in a silent prayer that in its distribution the Cedarmen may not be entirely overlooked.

After reading his regular report, which follows, Secretary McKinney read resolutions prepared and adopted on the death of Vice-President E. C. Norton:

Mr. President and Gentlemen: From the reports handed you this morning, covering aggregate of stocks in the hands of the members, also stocks in the states of Michigan, Minnesota and Wisconsin as compared with stocks on hand a year ago, we find the association starting the year 1912 with practically the same amount of stock on hand as January 1, 1911. Our report of shipments for the first six months of the year seemed to indicate that January 1, 1912, would show very much smaller stocks on hand than January 1, 1911. We considered our estimate of production for the season 1910 and 1911, at least 25 per cent high, but it is evident from the amount of stock shipped to the ultimate consumer during the year, as shown by our monthly shipping reports and the amount of stock reported on hand January 1, 1912, that the estimate was about right.

Using the report of the United States government in the consumption of white cedar poles in the United States, we figured that during the year 1911 the consumption for 16 foots and up would be about 2,385,000, and, using that as a basis, if the association furnished the bulk of the stock, there should not be much over 650,000 poles 16 feet up in the hands of association members, January 1, 1912. There is no doubt the consumption of poles for the year was greatly below this estimate. We find that while we shipped 1,659,920 poles from 16 foot up, we still have on hand 1,271,881 pieces. Had the consumption for 1911 come up to our estimate we would probably not have had over 700,000 poles on hand. Our figures show that there are 118,435 less poles from 16 foot up on hand than on January 1, 1911, and only about 44,000 less from 20 foot up, which is very much less than our estimate, and shows that while the consumption was less than our estimate, the production was more or at least up to the estimate.

During 1911 the secretary issued a revised edition of the Reference Book, also a new edition of the Freight Rate Book, based on Rexton, Mich., covering most of the points in ten states covered by the Western Trunk Line Association, or where there was a joint through rate made from Rexton. The new book covers all points named in the 1909 edition and over twenty-two hundred additional points. So far there have been changes in rates but to four places since the book was issued.

There was very little demand for inspection during the year, but seven requests being made. Those in this immediate neighborhood being made by the secretary, and the more distant ones by inspectors furnished through the secretary's office. With one exception, post shipments were the ones that demanded attention.

In accordance with a resolution passed at the last annual meeting, the secretary opened up a register of commission men in order to find out when they were selling for more than one party and informed the members of the fact where two of them were making prices to the same man. It was understood that the members should decide which one should quote him. We have no record as to how this question was settled between the members.

There seems to be some difference of opinion amongst the members as to what prices should be quoted in making quotations for a market report. The resolution passed at a special meeting April 21, 1905, states that members shall quote their lowest prices. Does this mean to pick out the lowest price you have made on each item, or your average price?

There has been issued from this office during the year a monthly report of shipments out of stock to the ultimate consumer, which has been of great value, in keeping you posted in the general movement of stocks and giving us a complete record of the shipments for the year. We did not have a record of shipments in 1910, but for only five months, which could be used for comparison. This report showed an increase of about .135 per cent in shipments in favor of 1911. There has also been issued during the year market reports, a report of stocks on hand July 1, 1911, as compared with July 1, 1910, and an estimate of the consumption of cedar poles for 1911 in the United States.

The business affairs of the Bemidji Weighing Association, composed largely of our members, who maintain a weigh-master at Bemidji to look after the scale of weights of cars shipped by members, has been handled through this office. About three thousand cars were weighed during the year at a cost of about 35c per car.

Death entered the ranks of our members during the past year and on December 9 removed from our midst our esteemed vice-president, Ernest C. Norton, of Escanaba, Mich., whose death caused profound sorrow to the members of the association. Immediate action was taken by the Board of Directors, in passing fitting resolutions and sending a floral remembrance in the name of the association. A copy of the resolution signed by the officers and directors was sent to Mrs. Norton and a copy made a part of the records of the association.

On account of retiring from the cedar trade, three members withdrew during 1911, the Hall L. Brooks Company, the Ford River Lumber Compny, and the Minneapolis Cedar and Lumber Company. One new member was admitted, the St. Croix Pine and Cedar Company, of Blackduck, Minn. The association now consists of twenty-eight members.

The financial report of the association as presented by Treasurer W. B. Thomas was as follows:

Balance from last year	$ 920.43
Dues from twenty-eight members	2,100.00
Interest	18.00
Total	$3,038.43
Disbursements	2,584.91
Balance January 2, 1912	$ 453.91

In accordance with the suggestion that a tie and pulpwood department be organized, the following committee was appointed to consider the matter: M. H. Schussler, chairman; T. P. Bradley, A. T. Naugle, L. A. Furlong, H. W. Reade.

The annual banquet of the association was held on Tuesday evening. The officers selected for the coming year are as follows: President, Thomas Pierpont Bradley, Duluth; vice-president, W. C. Moss, Minneapolis; treasurer, W. B. Thomas; secretary, H. H. McKinney; directors, H. S. Gilkey, J. W. Benham, L. A. Page and M. K. Bissell.

Those present at the convention and banquet were:

E. D. Alger, T. M. Partridge Lumber Company, Minneapolis; M. K. Bissell, Erickson & Bissell, Escanaba, Mich.; T. P. Bradley, Duluth Log Company, Duluth; Marshall H. Coolidge, Coolidge-Shussler Company, Minneapolis; E. L. Clark, Valentine-Clark Company, Minneapolis; H. M. Dixon, Cloquet Tie & Post Company, Cloquet; L. A. Furlong, Valentine-Clark Company, Minneapolis; C. W. Forbrich, *Electrical Review*, Chicago; L. L. Hill, Page & Hill Company, Minneapolis; J. F. Hayen, *The Lumberman*, Minneapolis; Paul L. Knolk, Wisconsin Land & Lumber Company, Hermansville; W. C. Moss, McCulloch & Moss, Minneapolis; H. H. McKinney, secretary, Minneapolis; Joseph Maloney, Maloney Bros., Spooner, Minn.; A. D. McIntyre, National Pole Company, Escanaba; H. L. McShooler; H. B. McMeal, *Telephony*, Chicago; W. L. Martin, Nebraska Telephone Company; Ed. J. Mock, TELEPHONE ENGINEER, Chicago; A. T. Naugle, Naugle Pole & Tie Company, Chicago; Joseph Naugle, Naugle Pole & Tie Company, Chicago; T. M. Partridge, T. M. Partridge Lumber Company, Minneapolis; H. F. Partridge, T. M. Partridge Lumber Company, Minneapolis; L. A. Page, Page & Hill Company, Minneapolis; William Patch, Crawford Cedar Company, Menominee; W. S Palmer, Valentine-Clark Company, Minneapolis; H. W. Reade, National Pole Company, Escanaba; Robert H. Ross, Chicago; M. S. Sperry, MacGillis & Gibbs Company, Milwaukee; M. H. Shussler, Coolidge-Shussler Company, Minneapolis; H. W. Squier, Panhandle Lumber Company, Minneapolis; W. B. Thomas, White Marble Lime Company, Manistique, Mich.; C. S. Williams, *Electrical World*, Chicago; Gilbert Willson, Valentine-Clark Company, Minneapolis; F. V. Weisenberger, timber agent, N. P. Railway, St. Paul; Harry Worth, Crawford Cedar Company, Menominee.

Idaho Cedarmen Meet

The annual meeting of the Idaho Cedarmen's Association was held in Spokane on January 8, 1912. In the absence of President Lindsley, G. C. Davis was elected temporary chairman.

The retiring officers, C. P. Lindsley, president, and H. C. Culver, secretary-treasurer, were unanimously re-elected.

A resolution was passed appointing a committee to prepare a set of by-laws for the association, and H. C. Culver, G. E. Merrill and E. A. Lindsley were appointed for this purpose. Special instruction was given the committee that a provision for the appointing of official inspectors to settle disputes between customers and the members of the association be incorporated in these by-laws.

The application of the Lost Creek Cedar Company for membership was received and accepted.

The report of the publicity committee was read and accepted, and they were instructed to continue their efforts. It is the intention of the association to cooperate with the government in making tests as to the strength of the various species of cedar used for pole purposes, and the committee was instructed to give the government every assistance possible.

In the evening a banquet was held, after which those present attended the theater. Those present at the meeting were as follows:

Neil Burrell, Valentine-Clark Company; M. P. Flannery, B. J. Carney & Company; H. C. Culver, Sand Point Lumber & Pole Company; G. C. Davis, Humbird Lumber Company; W. M. Leavitt, National Pole Company; G. E. Merrill, Pacific Fir Company; E. A. Lindsley and R. L. Bayne, the Lindsley Brothers Company; L. D. McFarland, Northern Mercantile Company, and Robert Jones, Lost Creek Cedar Company.

Petition to Dissolve Telephone "Trust"

A petition to dissolve the American Telephone and Telegraph Company on the ground that it is a monopoly in violation of the provisions of the Sherman law was presented to United States Attorney General Wickersham in Washington, January 23. The petition is signed by George Lambert, a justice of the peace in Pelham, N. Y.

The petition asserts that the American Telephone and Telegraph Company, which controls the Western Union Telegraph Company and eight subsidiary telephone companies in various parts of the United States, is one of the largest financial concerns in the world, having a capital of nearly $1,000,000,000, and it now dominates the telephone business of the country.

The petitioner claims that by reason of the company's control of subsidiary concerns in all parts of the country the independents are practically barred from competition.

It is charged that the operations of the American Telephone and Telegraph Company, in the acquirement of control of these subsidiary companies, were practically identical with the operations of the Standard Oil and tobacco trusts, which were declared illegal by the United States Supreme Court.

"While bigness alone does not make a corporation an unlawful monopoly," says the petition, "it is certain that an investigation of this gigantic corporation will show that its history is replete with acts and manipulations for the obvious purpose of obtaining control of the telephone business in this country, of a character that have been unequivocally condemned by the Supreme Court of the United States."

Special reference is made to operations in Ohio, Kansas City and Salt Lake City. The statement is made that in all parts of the West the independent telephone exchanges are threatened with extinction.

President Theodore N. Vail of the American Telephone and Telegraph Company, when asked about the petition, said:

"As regards the American Telephone and Telegraph Company being a monopoly in violation of the Sherman anti-trust law, I can only say that any act of this company in the matter of acquiring other concerns has been done either after a direct appeal by the company or with the acquiescence of the concern. Every act has been passed upon favorably by the authorities in the state interested."

The Department of Justice, it is known, has been investigating the corporation for several weeks to ascertain its relation to the Sherman law. The investigation has not been completed. The petition was referred to Assistant Attorney General Fowler.

Minnesota Independent Convention

The annual convention of the Minnesota Independent Telephone Convention was held at the Ryan Hotel, St. Paul, January 23. In his annual address President Clark referred to the advance made by the idea of commission control, with compulsory physical connection, among independent telephone men. Mr. Clark expressed himself as in favor of the right kind of competition, giving it as his belief that there are thousands more telephones in use in the state today than there would have been without it, but as conducted in some localities he believes the law should take a hand in putting a stop to the unjust conditions brought about by unfair competitive methods.

Among some of the matters discussed at the convention were the following:

A state law to compel physical connection between the independent companies and the Bell telephone systems.

Rates and service of all telephone concerns in the state to be regulated by a state telephone commission.

The Bell system companies to be forced to a more comprehensive system of accounting so that the Interstate Commerce Commission shall have information enough to enable it properly to regulate rates.

A system of interline communication by which any telephone subscriber in the state may be able to talk with a patron of any other company with the payment of a proper toll.

The following officers were elected for the coming year: President, Lucius F. Clark, Bellingham; vice-president, W. S. Clay, Hutchinson; second vice-president, George Ocobock, Norwood; secretary, A. C. Buck, Arlington; treasurer, P. M. Ferguson, Mankato.

The following is a partial list of those in attendance:

Jay Greaves, secretary and treasurer, and Edwin B. Greaves, McLeod County Telephone Company, Glencoe; C. E. Freeman, president, Franklin Local & Rural Telephone Company, Franklin; George L. Sterns, Tri-State T. & T. Company, Thief River Falls; George W. Obocock, Norwood Young America Telephone Company, Norwood; William Wohlhules, Tri-State T. & T. Company, Albert Lea; G. A. Schmitz, Stewart; J. E. Vanstrom, secretary and treasurer, Chicago City Telephone Company, Chicago City; D. D. Turner, manager, Northfield Telephone Company, Northfield; E. C. Kast, Tri-State T. & T. Company, Merriam Park; L. R. Duxbury, Tri-State T. & T. Company, St. Paul; B. M. Dun, Farmers & Citizens Mutual Telephone Company, Springfield; Olin Grundall, Bellingham Telephone Company, Elk River; E. B. Ruh, manager, Star Telephone Company, Farmington; V. S. Neill, secretary, Red Wing Telephone Company, Red Wing; C. L. Scofield, president, Swift County Telephone Company, Benson; E. W. Scofield, manager, Canon Falls; John Holeck, Brushvale Farmers Telephone Company, Brushvale; Manford Savage, president, National Independent Telephone Association, Champaign, Ill.; Lucius F. Clark, president, Bellingham Telephone Company, Bellingham; W. S. Clay, manager, Hutchinson Telephone Exchange Company, Hutchinson; A. M. Severson, engineer, Monson Automatic Telephone Company, North St. Paul; D. M. Neill, president, Red Wing Telephone Company, Red Wing; G. M. Dwelle, Sr., manager, Dwelle Telephone Company, Lake City; D. R. Savage, Windon Mutual Telephone Company, Windon; James A. Carey, secretary and manager, Greenwood Prairie Telephone Company, Plainview; A. J. McCulloch, manager, Zenith Telephone Company, Duluth; P. M. Ferguson, manager, Mankato Citizens Telephone Company, Mankato; W. T. Mallison, secretary and manager, Rice County Rural Telephone Company, Faribault; J. A. Upson, manager, Blue Earth County Telephone Company, Lake Crystal; C. B. Randall, manager, Stevens County Telephone Company, Morris; S. A. Vopatek, New Prague Telephone Company, New Prague; A. C. Buck, manager, Farmers & Merchants Telephone Company, Arlington; John L. Gulden, Interstate T. & T. Company, Austin; A. H. Evarts, secretary, West Concord Far. Telephone Company, West Concord; W. E. Leasman, manager, Madison Telephone Company, Madison; B. J. Robertson, manager, Lyle Telephone Company, Lyle; H. F. Luders, secretary, Norwood-Young American Telephone Company, Norwood; Lake Pepin Telephone Company, Lake City.

Manufacturers who had displays or were represented at the convention were:

Kellogg Switchboard & Supply Company, Chicago, by R. H. Coyne, E. G. Lawrence and G. A. Joy; Stromberg-Carlson Telephone Manufacturing Company, by F. K. Cannon and E. A. Reinke; Frank B. Cook, Chicago, by J. M. Moore and John F. Tompkins; American Electric Company, by Eugene L. Brown; American Cross Arm Company, by George Meyers; Dean Electric Company, by W. S. Williams; St. Paul Electric Company, by B. B. Downs, S. B. Howarth, A. R. Rhineberger, B. O. Hornton, V. W. Eaton and E. R. Smith; Northwestern Electrical Equipment Company, by A. J. Anderson, H. W. Wyatt and E. D. Vayo; Pyrene Company, by W. C. Atkins.

New York Telephones Increase

The number of telephones in New York City increased about ten per cent during 1911. During the past twelve years, the total increase has been 700 per cent, until today there are in service in New York City 440,000 telephones.

These 440,000 telephones are served through 64 central offices, and are connected by 1,196,821 miles of wire. An average day's telephone business in New York City means 1,900,000 messages flashed over the wires.

A new type of public telephone, known as the multi-coin pre-payment machine, has been perfected, and is now being installed in all of the boroughs. Very nearly 4,000 of these machines have been installed in the last three months. The sending of telegrams by telephone is another of the great conveniences that has been offered to the public during the past year.

During the year a change was made in the method of calling Philadelphia subscribers over the long-distance wires, with the result that service between New York and Philadelphia is now on what is known as a "two-number" basis; that is, you can call for a number in Philadelphia in the same manner as you would ask for a local call. This method serves to cut down the time of making connections between New York and Philadelphia to less than one minute.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

HERE is that one of the four cardinal points of the compass, at any place, which lies in the direction of the true meridian and to the left hand of a person facing the east. And here, too, is the direction opposite to the south. North, of course—Charles Howard North—anything other than a cold proposition! You'll agree that a name hasn't a lot to do with it when you meet up with Charley North.

He catalogues among the stouts, safely escaping, however, that rather recent whang, "Nobody loves a fat man," for everybody loves him. North is fattest when he gets into his hunting jacket and goes after ducks—say twenty minutes afterwards, because by that time he has fewer loaded shells and is an object of suspicion for the game warden. Let it be known that when he goes for ducks he gets 'em, right soon. It is then that his equator looms large and his wabble is perceptible for several blocks, or would it sound better to refer to the wabble across forty rods of swamp. At any rate, that's where he competes with the fats and makes his best showing.

Anything Other Than a Cold Proposition.

Another thing about North is his inclination to explore things in all directions contrary to his name. The insignia on the lapel of his coat shows that he has stood at the right hand of a certain point designated as the east, and his record shows that he has beat it around the world—not as a "beat," but as a first-class traveler. But he rarely goes south in summer for reasons too obvious to mention. And in his traveling, he prefers to sit out the night when the weather is rough, because of his experiences with wrecks. North has had samples of all kinds of rail disasters. When he sleeps on a train he has the pillows turned the other way—no head-on business for him.

Charles Howard North was born in a frame house in Loraine county, Ohio, April 14, 1860. His mother was a native of Ohio. His father was a Connecticut Yankee, which accounts for New England's claim to young North's first years. He lived with his parents in Connecticut until his father's death, attending the district school in summer and working in his father's shop in winter. The elder North was founder of a local bridge concern which afterwards became a part of the American Bridge Company.

In 1874 Mrs. North returned to Oberlin, Ohio, and her son followed a year later, where he entered the schools and devoted four faithful years to study, carrying his share of the work in supporting the family. At twenty-one, North accepted a position as lineman's helper with the Midland Telephone Company, afterwards absorbed by the Erie Telephone Company—the secretary of the Association of Telephone Pioneers of America will please note. In the sale of the Erie, North was not included, but having won his spurs he naturally sought a place in the switchboard construction department of what is now the Cleveland Telephone Company. This was early days for telephony and the early days spelled trouble from morning till night and from night till morning. North was called upon for the best he had and he had much that was good. He designed a switch that was approved—one that overcame many of the existing troubles. In 1884, North & Drumheller entered into a contract to install these switches in all the telephones of the Cleveland company. This was a side-line—North retaining his position with the company while fulfilling his special installation work.

In 1887 he dropped from the payroll of his employer and devoted his time with his partner in the further development of telephone improvements. Two years later he succeeded to the business on his own account. Ten years lapsed before the North Electric Company was incorporated, February, 1899. Most telephone men know the entire history of this big independent manufacturer.

C. H. North's inventions, some twenty-five or thirty, come under the head of detail patents—little requirements that add so much to efficiency of apparatus. These have usually become the property of his company; have contributed much to its success and have won an enviable reputation for the line of its manufacture.

It has previously been hinted that North likes to hunt. For years he has retained his membership in the Toussaint Shooting Club, which has a thousand

acres of marsh land two hours' ride from Cleveland, and where the ducks have been trained to march and fly in regular files. The chief requirement is to fire both barrels into the air at a given signal, get the rake and gather 'em up in wind rows. The trouble with this scheme is bagging an excess of twenty-five—the legal limit in Ohio. Mr. North is also a member of the Cleveland athletic and various civic and social clubs, but he finds lots of pleasure in his two by twice garden, where three hours slip away like thirty minutes.

Incidental to his business, it should be mentioned in passing, that it was C. H. North who designed and installed for the Cleveland Telephone Company in 1891, its first common battery board—the first in this country. Boards of similar type have been manufactured and sold ever since.

Interstate Commission Suspends an Order

The Interstate Commerce Commission has suspended an order establishing a system of accounting for telephone companies which was to become effective January 1. The suspension was ordered by the Interstate commission because of suggestions made by the Nebraska Railway Commission in the proposed system. U. G. Powell of the Nebraska commission's accounting department made the suggestions which caused the Interstate commission to suspend its order. He proposed simpler methods of accounts for small telephone companies which because of their outside connections are common carriers.

James S. Harlan of the Interstate Commerce Commission states that the suggestions are very much appreciated and that further time is desired for the study of the proposed changes. He says the Interstate Commerce Commission will send a representative from its accounting department to Lincoln to look over the system of accounting adopted by the Nebraska commission for telephone companies and the results obtained. The Nebraska commission objected to many of the changes proposed by the Interstate commission because such changes would overturn much of the work of the Nebraska commission during the past four years in the matter of reports of telephone companies. The Interstate commission only recently acquired jurisdiction over the telephone companies.

The complaint of the Bradshaw Telephone Company against the Nebraska Telephone Company, alleging that discriminatory rates are charged at Bradshaw, has been withdrawn for some reason not given.

Telephones in the Belgian Congo

All telephone and telegraph lines of the Belgian Congo are owned and operated by the government, according to consular report. The wires as a rule extend along railroad lines or the Congo river and are used for both telephone and telegraph service. The approximate total mileage of wire is 1,685, of which 685 is not yet equipped with telegraph instruments. The charges for messages range from about 40 to 90 cents according to distance, for five minutes' conversation, and from 40 cents to $1.10 for 15 words sent by telegraph.

During 1910 the king of Belgium allotted a part of a fund of $636,900, which is to be used each year in the improvement of the Congo, for the purpose of erecting experimental wireless stations. An expedition proceeded to the Congo early in 1911 for this purpose and now there are stations in successful operation at Boma and Banana. Other stations are being erected at Leopoldville, St. Paul de Loanda in Angola, and Loango in French Congo, which when completed and operated in connection with the cables will bring the Congo into close touch with the rest of the world. If these experiments are considered successful, wireless stations will be erected throughout the country and in a large degree supersede the wire systems.

There are cable connections between Boma, by way of Brazzaville and Libreville, with Lisbon, Cadiz, Brest, Teneriffe, and St. Vincent. It is rumored that the British African Cable Company will extend a branch cable to Banana at the mouth of the Congo river. This would considerably decrease the time to Europe. The charge for messages from Boma to New York is about $1.60 per word.

Half Rates for the Holidays

As a result of a half-rate made by the Mountain States Telephone and Telegraph Company on Christmas day more than 12,000 long distance calls were recorded on the system, covering five states, and taking in a list of some 176,000 telephones. Eighteen hundred calls were received through the general office in Denver and over 1,300 long distance calls went out from this city, all of them carrying "A Merry Christmas" into some home.

The number of "greeting calls" Christmas exceeded those of 1910 by more than two-thirds. This is the first time a reduced rate had been made on the long distance telephones. Reports from Salt Lake, Helena, El Paso, Cheyenne and all of the larger stations in the five states is to the effect that the lines were kept busy most of the day. So heavy was the demand that the half-rate time, which had been advertised for the forenoon only, was extended all day.

At headquarters in Denver a great deal of rivalry was manifest among the operators as to who would receive the first Christmas call, and also which would make the most connections.

Not only were the patrons given a half rate, but the several hundred operators were placed on short shifts, which meant double pay for their services.

This innovation was made by the telephone company as a sort of Christmas present to patrons and the amount donated reached several thousand dollars.

Since Christmas nearly every town in Great Britain has had direct telephonic communication with France, due to the new cross-Channel cable just laid by the British Post Office. The usual charge is $2 for three minutes' conversation, though rate reductions are planned.

According to the budget for 1911-12, the Government of Australia proposes to install telegraphs and telephones at an estimated cost of £1,300,000 ($6,326,450), and wireless-telegraph stations at an estimated cost of £16,800 ($81,757). No particulars are supplied with reference to the time before which tenders should be made or of the department to whom application should be made for particulars. Address on file in Bureau of Manufacturers, Washington, D. C., No. 7916.

Service, and the Chief Operator

By Percy Redmund*

THE word "service" means something done for someone else. Telephone service is what we, of the telephone company, do for the public. The giving of telephone service is the telephone operator's duty to the public as well as to her employer. Telephone service, to be service at all, must be accurate and fast. We often hear of good service and poor service, but there is, really, no such thing as poor service. If the telephone company does not make connections accurately and quickly there is no service at all.

Telephone service is a talking connection between two parties. It is something very definite and positive. The connection must be either right or wrong. If it is wrong, it is not service at all. Therefore, telephone service must be accurate. If the telephone cannot be relied upon, if it is not dependable, if it makes mistakes, it is worse than nothing and is like the servant who when relied upon in an emergency, is afterwards found to have lied. Telephone service is the fastest known means of communication. If the telephone is not quicker than the telegraph, it is an unnecessary duplication, and the public is in the position of a woman who has two servants both trying to dress her hair at the same time.

Telephone companies have to ask the public to allow them to set poles in the streets, and sometimes to tear up the paving to put the wires underground. In return for these, and other privileges granted by the public, the telephone company is bound by law, franchise and public honor to give service. The chief operator, by her position in the organization of a telephone company, is the chief person in each town or city who is charged with the fulfillment of this duty to the public.

The quality of service must be considered by comparison. A chief operator must know, to start with, what grade of service is required to satisfy the public in her town. It is not necessary to give the same grade of service in a small country hamlet as is required in a large city. In the big city centers of business and finance, everything is brought up to a point of perfection, which is not found in the rural districts. Telephone service must respond to the local requirements and local conditions the same as everything else. Therefore, the first thing to be determined by a chief operator is what grade of service must be given in her town. This is generally decided for her by those higher in authority. But if it is not, the chief operator must talk the matter over with the local manager and decide for herself.

The required grade of service should be expressed in standards, with which the service actually given may be compared. The quality of the service actually given can best be determined by inspection and tests, but at small offices there is little opportunity for this, and the chief operator will be forced to gather her information regarding the service from the complaints received and from opinions expressed by subscribers. The manager, whose duty it is to look after the company's general business interest, is in a position to tell the chief operator, very accurately, what the public opinion is of the service.

There are two very general causes for failure of service: The first is poor work by the operating force, and the second is poor facilities.

Poor work by the operating force may be from many causes. The force may be without organization, without direction and without a leader. If the operating force is made up of several people, there must be organization if good results are expected.

Organization is the proper arrangement of the parts. The employees are the parts. Every employee in the force must be arranged and assigned a definite duty and a definite responsibility. Every employee must be told by the organization who is her boss, and who are under her direction. Each employee must be told just what her duty and responsibility is and to whom she is held accountable. The organization must make plain, to every employee, who is boss at all times. Even when there are only two persons working it is necessary that one shall have authority over the other. One of these must be the boss, and it must be definitely understood which one is. A force, no matter how small, will not turn out good work unless there is a boss on the job.

Poor work by an operating force may be the result of the operators not knowing how to do the work right. Perhaps they have never been shown. A common mistake of chief operators is to forget and neglect that very important part of their work, teaching. Operators cannot be expected to learn without being taught. We often speak of a child who has had no "bringing up." A lot of operators are suffering from a similar neglect.

Chief operators, too often, divide their time between making reports and supervising the work. They assign their employees so that all switchboard positions are covered and all the calls are handled, but in all of these assignments no time is set apart for teaching or instruction. This is a mistake which is bound to show up in the quality of the service given. If your operators have had no "bringing up" in the work, if they, like Topsy, "just growed," if they have not a "proper education" in operating rules and methods, it is impossible for them to give service.

Every chief operator should learn the importance of teaching. Even in very large offices, where special teachers are employed, the chief operator should also be the chief teacher. She should direct the teaching and schooling of her force, even though she does not actually do it herself. The education of an operator never ends. They never get too good to learn. A competent chief operator can frequently show her most experienced operators how they can improve their work.

Another cause of poor work is lack of interest, spirit and enthusiasm. The spirit and enthusiasm of the force is, nearly always, a reflection of the chief operator's personality. If she shows spirited work and enthusiasm, coupled with a kindly nature and a dis-

*Address to the traffic department of the Pioneer Telephone and Telegraph Company.

position to tell her force of the interesting things about the work, the force will surely respond with interest and enthusiasm. The enthusiasm of a loyal, painstaking, earnest, hardworking operating force stands out as a diamond in the midst of precious stones. Enthusiasm is the brightest gem of the operating room. Enthusiasm in the force is the first important step towards good service. To get enthusiasm in the force it is absolutely necessary that the chief operator be enthusiastic herself. Next she must be fair and considerate with her operators, and third, she must tell her operators what

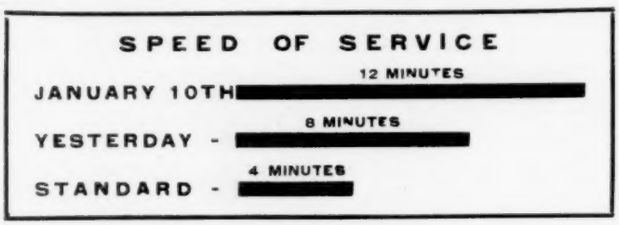


Fig. 1.

is being done in the work, why it is being done and what results are obtained. She must appeal to the reason and intelligence in her force; give them credit for having good sense, and of being able to understand the numerous little problems in connection with operating work.

She should show the force that she has confidence in their ability to understand the work by posting bulletins, stating as plainly as possible what service results are being obtained. The writing of bulletins is quite an art in itself. A bulletin should be written in a few words, but the point must be made clear, and the bulletin should be "catchy." By "catchy," I mean that when it is read, it will "catch" in the mind and remain.

For example, suppose the speed of service two weeks ago was twelve minutes and that it has gradually been improved until yesterday it was eight minutes. Further suppose the standard is four minutes. These facts and figures should be given to an operating force, and a bulletin, such as shown in Fig. 1, will be found to be much more effective than a bulletin such as shown in Fig. 2. Notices and bulletins should, whenever possible, show a comparison. You can compare either with a standard, or with results previously obtained, or with results obtained by other offices.

Competition is useful in working up enthusiasm. We all have a pride within us, which can be awakened and developed into enthusiasm by competition. A chief operator can arrange for competition in numerous ways. One can have competition between offices, or between the individual operators in an office, or, in a large office, between the supervisor's divisions of that office. Competition makes the work interesting to the force, and it gives the chief operator a good opportunity to find who are the best workers. Furthermore, it gives her an opportunity to recognize the winner. Some kind of prize, such as a banner, or a picture, may be used with good effect, although not at all necessary. A hearty "Well done" from the chief operator will often be appreciated more than anything else.

Never forget that your force is human. We often hear ourselves, and our fellow employees in large corporations, referred to as parts of a machine, and it is pointed out to us how one employee's work fits into the general scheme. We are thus likened to cogs of a wheel, or perhaps one wheel of a great machine. But a chief operator must see clearly the limitations of such a comparison. The comparison to a machine is all right in a way, but it does not go very far. As chief operator she must learn that such comparisons are drawn only to illustrate some few features of the workings of a large force. An operating force is human, sensitive, and extremely responsive. The better she understands human nature the more successful she will be as chief operator. Kindness on the part of a chief operator will have a tremendous effect on her force.

Authority does not mean harshness and bulldozing, nor should it be tainted with favoritism. Authority, to be lasting in effect, must be just and considerate. A chief operator may be kind and at the same time strict. It is not kindness to your employees to allow them to do things which they should not do. Discipline enforced, with a personal consideration of the individual, is true kindness. We are all sensitive—some more so than others—and you should always remember this when working with your force.

Every person working in an office has some effect on all the rest. The effect may be slight, but it is surely there. The higher in authority or seniority a person is, the greater will be her influence upon the rest. The personality of the chief operator will have a very noticeable effect. An operating force will, to a considerable extent, reflect the personality, individuality, the frame of mind, and the general attitude of its chief operator.

If she is discouraged, her force will be discouraged.

If she is irritable, her force will be irritable.

If she is indifferent, her force will be indifferent.

If she is earnest, her force will be earnest also, and if she is enthusiastic, she will have an enthusiastic force.

A successful army will undertake anything, even the impossible, but they must not be allowed to taste defeat. As "general" of the operating room the chief operator must be optimistic, that is, be bright and cheerful, be hopeful and have confidence in herself and in her force. She must look on the bright side of things. She must not be afraid of anything. She

NOTICE
THE STANDARD FOR SPEED IS FOUR MINUTES, TWO WEEKS AGO OUR SPEED WAS TWELVE MINUTES, YESTERDAY IT WAS EIGHT MINUTES, WE HAVE MADE SOME IMPROVEMENT BUT WE NEED TO MAKE CONSIDERABLE MORE.

Fig. 2.

must never say "can't." On the other hand, she must show good judgment in leading her force. She can show her good generalship by planning her campaign, taking up the various features of operating separately; tackling the easiest first, then the next easiest and so on until she leads her force up to the hardest feature of the work, strong with confidence and enthusiasm resulting from the successes through which she has led them.

Over-loaded operators will show the results of the over-load in poor work, and if the operators are

under-loaded, poor work is just about as sure. An operator should have enough work to keep her busy, but not so much that she has not enough time to do it thoroughly.

The matter of operator loads has been given special study by the best telephone engineers in the country. They are now able to give us tables which show just how much traffic an operator should be required to handle under varying conditions. These standard loads should be followed closely where they apply. But, like all other good things which our engineers give us, these loads must be applied with good common sense. In using them, we must recognize any local conditions which affect the amount of work an operator is able to handle. In small offices it is particularly necessary to exercise the best of judgment in using this kind of information.

Poor facilities are the other cause mentioned for the failure of service. By facilities is meant the telephone plant, composed of switchboard, lines, telephones, etc., which is at the disposal of the operating force for the purpose of giving service. If these things are inadequate, that is, if there are not enough of them, or if they are not in good working order, service cannot be given.

If any part of the plant becomes out of order, the chief operator should promptly notify the plant department, and if after such notice the trouble is not cleared within a reasonable time, the chief operator should report to her boss. She should co-operate with the plant department, so that she will know whether or not that department is doing all that it should to keep the plant in proper working condition. Of course, she is not supposed to follow up the plant man's work in a technical way, but merely in a general way. From her experience in the business she has some idea as to whether the plant conditions are as they should be or not. If she feels that the plant department does not handle trouble as promptly as it should, or does not keep the plant working so that she can give satisfactory service, she should so report to her superior.

In following up a case of trouble, a chief operator should be very careful not to attempt to "boss" the plant department employees, because that is overstepping the bounds of co-operation. She has no authority whatever over anyone in the plant department. The organization requries the plant department to do some work subject to her OK but that OK does not give her any authority over the workman.

Dirty switchboard plugs, dirty equipment of any kind, noisy lines, poor transmission, are all bad plant conditions, and if they are not cleared up within a reasonable time after the plant department's attention has been called to them, she should report the case to her superior. Poor equipment conditions, or poor line conditions, should not be allowed to continue. It is the duty of the plant department to turn over the various parts of the plant in a satisfactory condition for service. If there are not enough lines, or not enough switchboard positions, or if something should be changed, she should advise her boss, at the same time giving reasons.

Engineers are constantly at work studying the traffic, planning for the future, and arranging to fill needs as they develop, but it is very necessary that the chief operator, also, should watch conditions and report her needs to the boss, and in that way assist the engineers. She is on the ground and sees the conditions at the office day after day. The engineers cannot succeed without the advice of chief operators.

Record of the New York Commission

The jurisdiction of the New York Public Service Commission, second district, was extended in September, 1910, to telegraph and telephone corporations, and the work of supervision of these corporations is now fully organized. As a result of inspection by commission employees, a vast number of defects in operating efficiency and methods, as well as of the equipment, lines and apparatus, has been found in telephone plants. During the year, 424 central offices serving 372,860 sub-stations have been inspected. The commission during the year completed its investigation of the Interborough toll rates in the city of New York, and made an order reducing the rates between New York and Brooklyn from 10 to 5 cents. This included a general readjustment of toll rates within the city, and also brought about a change of rates between the Borough of Manhattan and points in New Jersey served by the company.

Attention is called to the exemption of telephone companies having property of less than $10,000 in value which do not come within the jurisdiction of the commission. The commission has no power to make an examination of the property of a company which claims to be without its jurisdiction, and it is possible for companies to organize with less than $10,000 of stock and obtain a foothold in communities without any regulation or supervision whatever by the commission, and thereby defeat the real purpose of telephone regulation. The commission says that beyond question there are several hundred telephone corporations within the state which should not be subject to the supervision and jurisdiction of the commission, but the commission should have sufficient power to ascertain its jurisdiction and to close the door to those evils which will in time inevitably spring up from the legal permission to authorize companies with less than $10,000 of property which will ultimately acquire property above the jurisdictional point without knowledge or authorization of the commission.

Further attention is called to the fact that under the law as it stands the stock of one telephone corporation can be purchased by another without application to or authorization by the commission, or local plants can be transferred in the same manner. Companies in most cases can be consolidated or merged in precisely the same manner as before telephone companies were placed under the jurisdiction of the commission.

Attention is also called to the tendency to consolidation among telephone companies of importance, and it is clearly apparent that the New York Telephone Company will sooner or later absorb all of the so-called Bell companies existing in the state; and that in the western part of the state the Federal Company is assuming the same policy with its subsidiary and affiliated corporations. The legislature is asked to note that if any evil is in this policy, measures to correct the same should be taken.

The commission has before it a number of complaints as to increases in telephone rates. Hearings have not been appointed upon these complaints for the reason that the commission has decided to select two or three of the typical cases which cover all of the

points involved and upon which determinations will practically settle the remaining cases. Before taking up these cases the commission is conducting a thorough examination into all the elements which go to make up such rates. Telephone rates present some complications not arising in other classes of public service, and therefore the commission feels that it is of extreme importance that a substantial groundwork be constructed for the determination of rate cases.

The commission has submitted as the estimate necessary to carry on its operations during the fiscal year commencing October 1, 1912, $381,927.50, which is a trifle less than was appropriated by the legislature for the year commencing October 1, 1911.

Lincoln and Nebraska Companies Get Together

Negotiations between the Nebraska Bell Telephone Company and the Lincoln Telephone & Telegraph Company, which have been pending for a number of months, were formally concluded January 8, when announcement was made that the Bell had sold its holdings in twenty-two counties in the South Platte to the Lincoln company, and that the latter, in turn, had withdrawn from the North Platte by disposing of its interests in the companies at Fremont, Grand Island and in Howard county.

This gives over to the Lincoln company, subject to the competition of other independents located in the territory, all that part of the state south of the Platte and from the Missouri river to the west line of Webster and Adams counties. It gives over to the Bell, subject only to the competition of the independents therein, all of the remainder of the state. These other independents will retain their present status, and as the negotiations were participated in by representatives of all of the larger independents operating on both sides of the river, a general understanding exists as to what the future holds for them. It is understood that their present independent connection will be maintained, and they will be given opportunity to tie up with the Bell also.

The Lincoln company, previous to the consummation of this deal, owned four exchanges and had large stock interests in twelve others. Outside of the company, however, are several independent companies of fair size and a large number of small mutuals. With these connection will be maintained.

The agreement provides for a ten-year connection contract with the Bell lines outside of the territory. This means that toll line connections will be made along the river towns, thus giving a unified service where, heretofore, those on one system could not communicate with subscribers on the other system. The connection contract of the Lincoln company with all of the other independents in the state will also be protected.

The purchase price paid by the Lincoln company for the Bell property is $2,205,750, payable in 5 per cent cumulative non-voting preferred stock of the Lincoln corporation. These figures represent the inventoried physical valuation of the property transferred. The Bell also sells its interest in the independent companies at Plattsmouth and Nebraska City and the Golden Rod and Butler County Independent companies, but the purchase price of these just about balances the sum paid for the four independent companies north of the river that the Bell buys. In addition the Bell binds itself to purchase an additional half million preferred stock to finance the cost of consolidation and to underwrite all necessary bond issues. This gives the Lincoln company strong financial connections in the east. This preferred stock gives the Bell no voice in the management, the common stock controlling.

The Nebraska State Railway Commission has approved the purchase of the Bell telephone system in the South Platte country, by the Independent company of Lincoln. The order of the railway commission is:

First—That the articles of incorporation of applicant be amended according to law, increasing its capitalization to $11,250,000, consisting of $1,250,000 of 6 per cent, non-voting preferred stock; $7,500,000 of 5 per cent, non-voting special preferred stock, and $2,500,000 of common stock.

Second—That said stock shall be issued for money only, and for not less than par value.

Third—That the funds derived from said proposed issue of stock shall be used for that purpose named in the application, and for none other.

Fourth—That all contemplated investments in associate companies from proceeds of such stock shall first be submitted to this commission for approval before consummation.

Fifth—That said Lincoln Telephone and Telegraph Company shall file with the commission verified statements showing the proceeds derived from the sale of said stock, and the purposes in detail to which such proceeds have been applied, said statements to be filed within thirty days of the time when the unreported amount of money realized or expended exceeds the sum of $50,000.

According to the financial statement filed, the assets of the Independent company of Lincoln, amount to $2,151,445.25.

The Nebraska supreme court has issued an order dismissing the injunction suit of the state against the American Telephone & Telegraph Company and others, a suit to prevent the Bell Telephone Company from buying the independent telephone exchanges at Plattsmouth, Nebraska City and Papilion. The case was dismissed by consent of all parties concerned, including the attorney-general, who was nominally the prosecutor of the case. It was represented to the court that the recent agreement between the independents and the Bell company had settled the matters involved in the injunction case. The two telephone companies have agreed to pay the costs.

Wood Preservers' Convention

The Wood Preservers' Association recently held its eighth annual convention at the Hotel Sherman, Chicago, beginning January 16. The meeting was opened with a brief address by John T. Logan, of Texarkana, president of the association, in which he set forth in a few words the nature and purpose of the organization and also spoke of its rapid growth in both numbers and influence. The association is the court of final appeal on all subjects pertaining to wood preservation. The report of the secretary, F. J. Angier, of Baltimore, showed a membership of 104 at the close of 1911, an increase of 60 per cent. The fact was brought out that the association is co-operating with the United States Forest Service in preparing bulletins on the preservation of poles, ties, piling and other wooden structures. As a tribute of respect to the memory of Charles D. Chanute, well known in this field, the first session adjourned early. An eloquent eulogy was also delivered by W. F. Goltra of Cleveland.

The Telephone Scrap Book

DOLLAR SCRAPS.

"Scraps" suitable for this department will be paid for at the rate of one dollar each. Each scrap must have at least one illustration, for which a rough pencil sketch will suffice. Practical kinks for workers are most desired, although any original matter that is really interesting is acceptable. A kodak snap-shot with a few words of explanation may be just as satisfactory to the editors as a long article. Unusual scraps will be returned, and the used ones will be paid for after publication.

Connecting Toll to Grounded Lines

IN small magneto exchanges where grounded country lines prevail, inexperienced operators frequently render a long distance connection very noisy by plugging up the metallic toll line to the grounded line, using a straight pair of cords. In the smaller boards one usually finds from two to three cord circuits equipped with repeating coils and the operator pays very little attention to these in particular, other than to the straight-away cords. Occasionally she seems to remember that repeating coils are to be used in connection with toll lines, and if she has one not in use at the time sometimes uses it.

To overcome this difficulty a simple remedy is described by F. L. Whitaker, Etna Green, Ind. One way would be to insert a ring-through coil directly in the metallic line; but as such a coil is expensive very nearly the same results may be had by using an ordinary coil cut into a ringing and listening key in the regular way. This may be connected to the metallic line as shown in the diagram.

To connect the line to the key as shown, remove

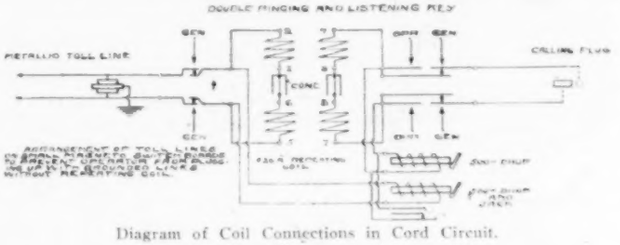


Diagram of Coil Connections in Cord Circuit.

the answering cord from the board and use the terminals vacated by it for the toll connections. Remove the line jack and drop from its place and, if possible, mount it directly above or below the clearing-out drop of that particular cord circuit or key. Bridge the jack to the terminals of the clearing-out drop and run a pair of wires from the line drop to the line side of the repeating coil.

To prevent ringing current from shunting through the coil windings and away from the drops a pair of condensers may be cut in series as shown.

This arrangement reduces the operator's work to some extent, as a call coming in over the toll line may be answered by simply throwing over the listening key or cam. Ringing on the toll line is accomplished with the ring back side of the key.

Cutting the line jack in on the calling plug removes the possibility of the operator plugging in ahead of the coil. Two drops cut in on either side of the coils and condensers gives operator double ringing supervision. Any good repeating coil will do for this circuit.

Magnet Spool Windings

ACCURATE calculation of the number of turns of a certain commercial size of wire to give a required resistance, when wound under factory conditions on a magnet spool of given length and size of core, is made impossible by the various conditions which are imposed. This is particularly true in the case of the smaller sizes of wire, say, from No. 30 to No. 40 B. & S. The principal variations which occur

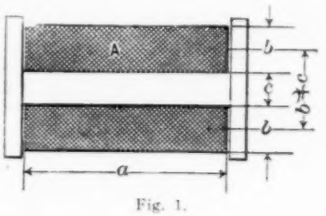


Fig. 1.

to make accurate calculations impossible are variation in the diameter and cross-section of the conductor; variation in the conductivity of the conducting material; variation in the thickness of the insulating material on the conductor and between layers, etc.; variations due to the personal factors of winding operations, etc.

An analysis of the problem initially disregarding all of the variations mentioned would justify the following conclusions:

The number of turns N in a coil, using a certain size of wire, is directly proportional to the area A of the cross-section of the winding. That is, referring to Fig. 1, N varies as A where $A=ab$.

The resistance R of a coil using a certain size of wire is directly proportional to the volume V of the space occupied by the winding. Referring again to Fig. 1, R varies as V, where $V=fA$, and f=the length of a mean turn=3.1416 $(b+c)$ or $V=3.1416\ ab\ (b+c)$.

If it were possible to wind coils and maintain the position of the conductors relative to each other, as shown in Fig. 2, the relation between the number of turns N and the area of cross-section A would be represented by the equation

$$N=\frac{A}{d^2}$$

where d is the outside diameter of the insulated wire.

Since, however, the real conditions which exist are more nearly illustrated by Fig. 3 in the case of good winding and Fig. 4 in the case of poor winding, the impracticability of the above equation is at once

recognized. It is possible, however, to make the equation practicable by replacing d^2 by a constant "K." It will be noted that since "K" is equal to $\frac{A}{N}$ it can be readily determined for any size and kind of wire by simple experiment. When once determined it is available for all problems using the same size of wire. It is interesting to note that the constant K is also equal to $\frac{V}{L}$, where L is equal to the total length of the wire. This is easily derived from the equation

$$K=\frac{A}{N}$$

by multiplying both the numerator and the denominator of the expression $\frac{A}{N}$ by f, the length of a mean turn, since $Af=V$ and $Nf=L$.

In determining the value of K for a given size and kind of wire, care should be taken to insure that the coils from which the constant is determined are representative of average conditions. The constant K for a given size and kind of wire may be different in

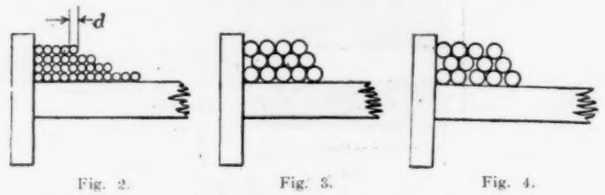


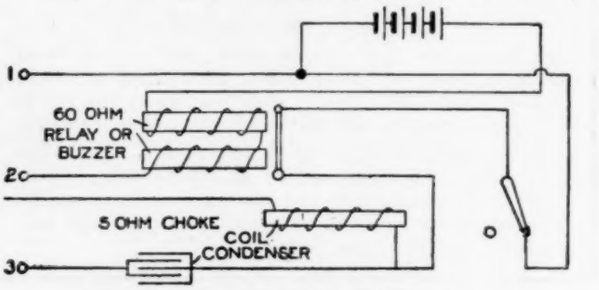
Fig. 2. Fig. 3. Fig. 4.

two factories or for two different winders in one factory owing to various causes, such as difference in the inspection limits for the diameter of the wire and in the thickness of insulation on the wire, variation in the amount of insulation between layers, variation in the skill of winders, management, etc.

Trouble Man's Test Set

A HANDY test set for telephone trouble men is described by George M. Peterson in *Popular Mechanics*. The instruments necessary are a voltmeter having a range of from 0 to 150 volts, a portable battery having an electromotive force of from 100 to 130 volts, a Wheatstone bridge, a fault finder, a buzzer test set, a galvanometer and an induction test set usually make up a trouble man's outfit. These instruments must be purchased from some maker of standard goods, but the battery and buzzer test set can be made in a short time and will give better satisfaction than any which can be purchased complete.

The battery consists of 40 pocket flashlight batteries, each one of which has an EMF of 2½ volts. A box is made in which to place the battery for carrying purposes. As the batteries each measure about 3 by 3½ by ¾ inches, and are usually placed two wide and two high, the carrying case should be about 7 by 8 by 10 inches inside dimensions, to allow space for the paraffin around each cell. The bottom of the box is lined with heavy paraffined paper. The batteries are connected in series and placed in the box, the connections are carefully soldered to avoid loose joints, and the positive and negative wires, which should be of No. 14 gauge lamp cord, are led up to the binding-posts on the cover. Several layers of heavy paraffin paper are placed between the rows of batteries and then the outfit is tested. If the test shows the battery to be perfect, the box is then filled with hot paraffin, care being taken to insure the wax getting into all the corners and inclosing the batteries in a solid cake. This will prolong the life of the battery 100 per cent. as it is protected from the deterioration due to dampness. The sketch shows how the battery is connected in circuit.

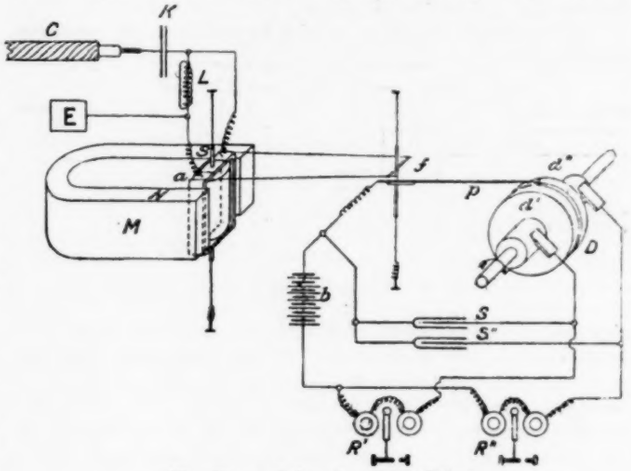


Buzzer Test Set Diagram.

The buzzer test set shown in the sketch should be made up and placed in a small box having a shoulder strap for carrying it easily. This set has the advantage over the old style in that it does not always require a head receiver. The relay, or buzzer, can be used, and the earphone usually can be omitted.

Submarine Cable Relay Diagram

A SKELETON diagram of the Brown submarine cable relay is shown in *Electricity*, London. *a* is a recorder coil suspended in the field of a permanent magnet *M*; *f* is a slight suspended frame to carry the relay tongue *p*; the frame is joined to the suspended coil *a* by two silk or quartz fibres. The pointer *p* is a fine siphon glass tube carrying through its bore a phosphorbronze wire. This wire is soldered to an iridium tip, which tip is shellacked to the extreme end of the siphon tube. The iridium tip bears lightly upon the surface of the drum *D*, which is kept revolving at about 150 revolutions per minute. The drum *D* is made in three parts: the two outer ones, *d' d''*, consti-

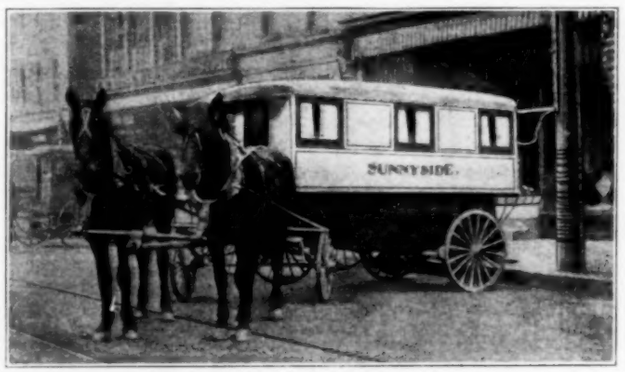


The Brown Submarine Cable Relay.

tute the "dot" and "dash"-marking surfaces, and the middle one, upon and in the center of which the pointer normally rests when no signal or current passes, is insulated. When the tongue is deflected by the movement of the coil to form say a dot, a circuit is made through the battery *b*, the tongue *p*, and the post office relay *R'*. A movement of the tongue in the opposite direction would close the circuit of the post office relay *R''*. The relay depends for its efficiency upon the reduction of frictional resistance to the lateral movements of the tongue. *S' S''* are condensers of 2 mf. each, used to short-circuit the sliding contact between the tongue *p* and the drum *d*. *K* is the receiving condenser, and is placed in the circuit to act as a curb to the signals and to block out earth currents. The current from the cable, *c*, passes through the condenser before flowing round the suspended coil *a* to the earth, *E*. *L* is a magnetic shunt of 30 ohms resistance, joined across the terminals of the suspended coil *a*. The relays, *R' R''* are joined up to two sounders which are connected to a battery to transmit the messages over the second line.

Market Wagon Equipped With Telephone

THE owner of Sunnyside farm, near Danville, Pa., has discovered a new field for the telephone and is profiting by it, says *Popular Mechanics*, as the field in question happens to be the inside of his neat and commodious market van. The telephone set is solidly mounted on the inside of one of the side walls of the wagon, and connection is instantly made with the telephone system of Danville the moment the



Telephone Connection with a Market Wagon.

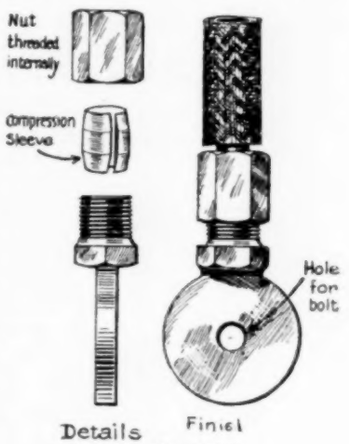
wagon arrives at the market. The wagon occupies the same position at the curbstone market each day, and as this position is adjacent to a telephone pole, a wire is run down this pole, terminating in a plug of the kind used with electric lights. When the wagon is backed up to the curb, the connection is made by means of a short length of insulated wire, and the proprietor takes orders from his customers and communicates with the farm.

The idea of grafting advertisements upon the telephone has been patented by a Swiss genius. The advertising announcements are to be introduced upon the lines so as to be heard by the person calling while awaiting the response of the operator and the response of the person called.

Connecting Wires to Terminal Lugs

METHODS of connecting wires to terminal lugs, using Dossert solderless connectors, are described by H. B. Logan in *Canadian Electrical News*. He points out that the usual methods require the following operations:

(1) To have or procure a plumber's furnace; (2) to get it ready for use; (3) to melt a pot of solder; (4) to cut the insulation from end of conductor and brighten end by scraping or sandpapering; (5) to smear the bared end of conductor with soldering flux; (6) to tin it by plunging it into the solder pot; (7) to knock off surplus solder; (8) to push the conductor into hole in lug; (9) to souse lug with wet waste to cool it; (10) to scrape or file off shreds and globules of solder; (11) to brighten surfaces of lug with fine sandpaper.



Solderless Connectors.

Contrasted with the foregoing, another method of connecting wires to terminal lugs is to use the Dossert solderless connectors which eliminate entirely the use of solder, requiring only the following operations:

(1) Cut insulation from end of conductor and brighten end by scraping or filing; (2) push conductor into hole in lug; (3) tighten up nut with wrench.

A comparison shows that the soldering method requires the use of the following adjuncts; plumber's furnace, means for heating same, solder, soldering flux, wet waste, file and sandpaper; whereas to connect up the Dossert lug requires nothing but jack knife, file and wrench. The saving in time, labor, materials and cost is increased by the fact that soldering operations usually require a man and helper, while a Dossert joint can be made by one man, no matter how large the cable. As shown in the figure the shank of this type of lug is threaded externally, while the hole is tapered. The compression sleeve is tapered at both ends and slotted longitudinally. The nut is threaded internally and tapered at the outer end. When the cable is thrust into the lug and the nut tightened up the action of the tapers and slotted sleeve exerts a pressure, on the conductor, of several thousand pounds to the square inch, according to size, thereby making good electrical contact.

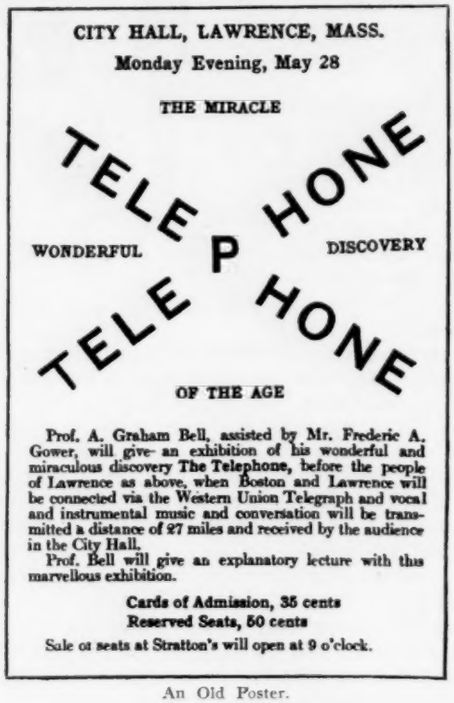
Telephone Attachments Barred Out

Judge Shattuck, in the Superior Court, in the case of Hoyer vs. Cincinnati Telephone Company, decided that the telephone company had the legal right to discontinue the service of a subscriber who used an attachment not furnished or approved by the company in connection with its instrument. The case was the result of an order issued by the company last January, directing that the service of Edward C. Hoyer,

of Hyde Park, be discontinued, after he refused to detach a hand-phone from the wires of the company. Hoyer, through his attorney, applied to Judge Shattuck for an order restraining the company from making the disconnection, which was temporarily granted. After final hearing the court held that the company had full control over its equipment and could exact the observance of certain rules, and dismissed the petition of plaintiff for the reason that it did not state facts sufficient to constitute a cause of action.

Ancient Poster for Telephone Show

A POSTER used in 1877—nearly 35 years ago—to attract pleasure seekers to the unique entertainment of witnessing a telephone demonstration was reproduced by the *Pacific Telephone Magazine*. Short as


CITY HALL, LAWRENCE, MASS.

Monday Evening, May 28

THE MIRACLE

TELE P HONE

WONDERFUL DISCOVERY

TELE HONE

OF THE AGE

Prof. A. Graham Bell, assisted by Mr. Frederic A. Gower, will give an exhibition of his wonderful and miraculous discovery **The Telephone**, before the people of Lawrence as above, when Boston and Lawrence will be connected via the Western Union Telegraph and vocal and instrumental music and conversation will be transmitted a distance of 27 miles and received by the audience in the City Hall.

Prof. Bell will give an explanatory lecture with this marvellous exhibition.

Cards of Admission, 35 cents

Reserved Seats, 50 cents

Sale of seats at Stratton's will open at 9 o'clock.

An Old Poster.

it is in most industries, a period of 35 years constitutes the lifetime of telephony. It is odd in this day to think of the telephone as merely a wonderful laboratory experiment, a sort of scientific legerdemain.

Seeking Efficiency

AN interesting efficiency test was recently applied by the general commercial superintendent of the New England Telephone Company to his subordinates. At a day's notice he ordered all of them in Maine, New Hampshire, Vermont and Massachusetts to mobilize at the headquarters of their respective districts and and take a written examination embracing some 200 questions covering not only their specialized duties, but the broader issue of the employers' department's relation to the other departments of the corporation, and also the relation of the corporation to the public it serves.

The purpose of the examination is said to have been twofold—first, to see whether these employes knew the correct answers to various questions relative to the cost and the giving of service, such as might be asked by a subscriber, for example, and secondly, to determine the individual efficiency of this army of employes, to the end that those qualified for advancement might be put in line for promotion and not remain submerged among the rank and file of a large organization.

Exploring Wiring by Reflection

IN wiring an old building or house where the wires must be "fished," the wireman often encounters some obstruction in the walls or ceiling. The method

Wiring with the Aid of a Mirror.

of exploring here illustrated, using a flashlight and mirror, I have found very serviceable, the hidden parts showing up in good shape in the mirror when lighted up by a strong flashlight, says Charles Olssen in *Popular Electricity*.

Experiments on telephonic communication between London and Basle, through Paris and Belfort—a distance of over 620 miles—have been carried out recently, with excellent results, thanks to the new loaded cable. Communication has also been effected with Amsterdam and several German cities.

The Necessity of the Telephone

The Emergency Telephone.

The Bride: "Hello! Is that you, mother? Well, I've got the roast in the oven, and it's beginning to sizzle. What shall I do next?"—*Life*.

History of Public Utility Commissions

By Arthur Stedman Hills*

WHY ARE PUBLIC UTILITIES COMMISSIONS HERE?

IN answering this question let us go back to the Middle Ages, to the period between the sixth and fifteenth centuries, for the purpose of observing the economic conditions which gave rise to the notion that some industries are affected with a public interest. There were no regulating commissions in those days, but there was a common law which was administered by the courts and it is well known that the ancient common law principles of serving all who apply, at fair rates, without discrimination, form the basis of our present day commission laws.

In early times, when the country was sparsely settled and traveling was hazardous and difficult, it became the customary law of the land that innkeepers should be charged with the public duty of housing all who applied for shelter; that the ferryman should transfer[2] safely all who applied for transportation; that the smith should shoe the horses of all in need of his services. The same duty of serving the public attached to the baker, the brewer, the miller, the surgeon, the victualer, the common carrier, and others. In fact, whenever economic conditions required it, public sentiment attached the stamp of public duty to occupations affected with a public interest. For example, the common smith was charged with a public duty because he was often the only smith for fifty miles around and the traveler's safety depended upon the shoeing of his horse; the ferryman was often the only connecting link between the shores of the stream across which the only highway led; the surgeon afforded the only means of medical assistance in a whole community, and so on. Those were the conditions under which were developed the common law principles of serving all who applied, at reasonable rates, without discrimination. Those were also the conditions toward the end of the Middle Ages when the earliest decisions of the courts of England were made upon this question of public duty.

In the year 1348 a suit was brought against a ferryman who overloaded his boat and drowned the plaintiff's mare, the charge being that he failed in his undertaking to carry for all safely.[1] In a case decided in the year 1450, we find this statement: "That it was agreed by all the court that where a smith declines to shoe my horse, or an innkeeper refuses to give me entertainment at his inn, I shall have an action on the case, notwithstanding no act was done, for it does not sound in agreement."[2] In 1460 it was held that: "If I come to an innkeeper to lodge with him and he will not lodge me, I shall have on my case an action of trespass against him; and in the same way if I come to a victualler to buy victual, and he will not sell, I shall have an action of trespass on my case against him."[3] At this period the courts were the regulators of wrongs committed by public servants.

In addition to such cases, may be found many early enactments of the English parliament, fixing the price of foods, wool and labor.[4] Even as late as the colonization of America, we find that the colonial assemblies enacted statutes fixing the price of bread, wheat and other staples.[5] The legislatures were called upon to assist the courts in protecting the public against extortion on the part of those in control of the necessaries of life.

Little by little, in the course of several centuries following the Middle Ages, arts and sciences were stimulated, new industries developed, the population increased and better facilities for inter-communication between different parts of the country were introduced. All this led to a different condition of things. Instead of one smith in a district or town, there were, perhaps, five or six; instead of one surgeon, three or four; instead of one victualer, several, and so on. Under such circumstances, it was not necessary that the common law obligations attaching to these occupations during the Middle Ages should be applied. If one smith would not serve, another was near by to do so. In other words, the elements of scarcity, or oneness, calling for the application of a restrictive policy gradually disappeared. Thus many of the old businesses dropped from the category of public callings as changing economic conditions ushered in a new system of regulation, the system of free competition, which reached its height during the first half of the nineteenth century.

In the United States especially, the policy of non-interference, as the system of free competition was called, found favor. The country was new, rich in resources and growing rapidly. The idea of restraint seemed almost incompatible with the principles of our government. Myriads of small enterprises were springing up and struggling for existence in competition with myriads of other small enterprises. What was needed most of all at this time was a means of easy and rapid inter-communication. It came through the discovery of steam power and the invention of the steam locomotive.

When the railroad companies began to build their lines unusual liberality was shown them. The states were eager for the benefits which might accrue to them through the introduction of the new means of transportation and were willing to give the enterprising railroad corporations every assistance. In Alabama for instance, special charters were granted the railroads by the general assembly as early as 1832 and as late as 1867. These charters were often supplemented by land grants, town bonds and other means of assistance, and not infrequently left the companies entirely free to fix any rates they might require. The charter of the Tennessee and Alabama Central Railroad left the company free to levy and collect tolls, provided the net profits should not exceed 25 per cent per annum. The early charter of the Selma and Greensboro Railroad Company provided that it might exact and receive

*Address before Accounting Theories and Talks Club, American Telephone and Telegraph Company, New York, November 15, 1911.

[1]Y. B. 22 Lib. Assis. 94, pl. 41.
[2]Keilway 50, pl. 4.
[3]Y. B. 39, Hen. VI, 18, pl. 24.
[4]51 Hen. 3 Stat. 1; 23 Ed. 3, cap. 1.
[5]Mass. Colon. Laws, 1672, p. 120.

such tolls as were required, provided only that they should be "annually established and published at each depot on said road, for the information of the public, which shall not be changed oftener than once a year."

Many other charters might be cited to show the high degree of liberality afforded to early railroads in the various states. In fact, until the railroads had attained vast proportions, and had acquired intimate connections with the business relations of the country, the public effort was to aid and urge their construction and operation. Competition and common law remedies had amply served to secure from the stage coach and water craft the fulfillment of the duties of common carriers and redress for their wrongs. So the states in granting liberal railroad charters relied entirely upon the same protections for their citizens, little realizing what a tremendous force the railroads would become in the industrial and political life of the community.

As time went on, competition between the various railroads became either a destructive struggle with ruinous and unsettling effects upon business, or was wiped out by combinations which jeopardized the transportation rights of the citizen, further increasing his disadvantage in pursuing his legal remedies through the courts. When this was realized and the popular mind came to understand the wrongs that were being committed by the railroads, by rebating, discriminating, defrauding the State, wildcat financing, unwise building, and by abusing in many other ways the privileges so freely given them, the policy of non-interference was repudiated and a violent reaction took place throughout the country, resulting in a tendency to deal with railroad abuses and unjust exactions and discriminations as with crime, specifically, through compulsory and penal legislation.

Michigan for example, although she had assisted the railroads in advancing their construction by granting most liberal charters, soon discovered her error. In 1874, the character of her legislation would indicate that the people found their railroads to be monsters of monopoly, who exceeded their rights and practiced upon the public every conceivable form of injustice, wrong and abuse. As is usual in such instances, popular indignation expressed itself in extreme measures. Impracticable restrictive laws were enacted in Michigan and elsewhere. But one of the unlooked for results of this restrictive legislation was a diminution in railroad construction. This was obviously detrimental to the interests of the whole community. Just here then a change of policy and a choice had to be made. High restriction had failed; free competition had failed. Some sort of regulation was demanded by the people. Should it be direct state control, or partial state ownership, or supervision by a commission or what? It was decided that the safest experiment would be the commission. Accordingly, Michigan and several other states after repealing their restrictive legislation, appointed commissions, some with moderate powers of investigation, some with extensive powers, even to the fixing of rates. There was naturally much opposition by the railroad companies, often terminating in long, legal controversies. Yet the results, on the whole, seemed so promising that a great wave of agitation for railroad commissions swept over the country. One by one the states fell into line. Some profiting by the experience of others omitted the trial of highly restrictive legislation and went at once from the policy of non-interference to regulation by a commission. Thus the immediate predecessor of the public utilities commission of today came into existence.

While the great movement for railroad commissions was between 1870 and 1885, there were several earlier commissions. Few of them, however, were created solely in response to a demand for the protection of public rights. The commission established by the New Hampshire legislature in 1844, is a striking example of the early New England commissions. It was a tribunal with practically no duties, no powers and no salaries. It exercised certain functions in the location of railroads and its members together with the selectmen of towns in which land was condemned, formed a joint board for the appraisal of damages. The commissioners were paid a small sum per day by the railroads themselves, according to the time actually spent. It may be said that this commission was organized more for the assistance of the railroads, than for their regulation, for at this time railroad development was so small that effective competition was provided by the boats upon the rivers and all kinds of vehicles upon the highways. A member of the public who felt that the railroad was attempting to impose upon him, could use his own team.

Other New England railroad commissions with very limited powers were established in Rhode Island in 1844, in Massachusetts in 1845, in Connecticut in 1853, in Vermont in 1855 and in Maine in 1858. The Massachusetts commission was appointed to investigate and report upon the many petitions for railroad charters presented to the legislature at that time, and after discharging its duties was dismissed in 1846.

In Pennsylvania, after private companies in 1823 and 1824, had failed to interest private capital in their projects, the States itself assumed the burden of building a railroad from Philadelphia to Pittsburg. A board of state commissioners located the route over the Alleghany mountains in 1828 and the operation and management of the system remained exclusively in the hands of the State, under a board known as the Canal Commissioners, until December, 1852, when the Pennsylvania Railroad took over the operation of the line, purchasing it in 1857.

It is apparent that these early commissions, while demonstrating the usefulness of an intermediate supervising or regulating body, were created to meet conditions very unlike those of 1870 and later.

By 1885 the real value of railroad commissions had been demonstrated. As stated by the New York Railroad Commissioners in their annual report for 1884: "One can well see that where railroads can begin operation and grow up under such a system, the principle of this form of state supervision can grow into and become part of railroad management without undue friction and with many beneficial results. Even in states, as in Illinois, it can be applied to a developed railroad system, and after years of jarring, contention and disturbance, can be made to yield apparent satisfaction. * * * Our brief review of commissions and their results may thus be stated: Through their well-directed efforts more has been done than through any other known method of state procedure to raise the railroads and the people to the plane which each must occupy before any satisfactory settlement of their relations can begin to be accomplished."

We now come to a very recent period, the last twenty or twenty-five years, during which great advances in science have been made, and new inventions have revolutionized living conditions throughout the country. By degrees it has been recognized that in many modern industries, competition as an automatic regulator of prices is either wasteful, or impracticable, or impossible. With the lesson taught by the railroads still freshly in mind, and with the conviction that many of these new industries were affected with a public interest, the people in their clamor for protection, agitated a movement for the establishment of public service, or public utilities commissions, which should afford the courts and legislatures the same assistance in the regulation of the newly developed public servants that the railroad commissioners had but lately rendered in the regulation of the railroads. Accordingly, suitable laws, embodying the ancient principles of serving all who applied, at fair rates, without discrimination, were enacted in many states. Under the jurisdiction of the utilities commissions thus created, we find not only the railroads, but also the great gas companies, electric light companies, warehouse companies, water companies, telephone, telegraph and cable companies, street car companies, express companies, and others. It is not difficult to see that economic conditions somewhat similar to those of the Middle Ages, when the baker, the miller, and the smith, were controlled for the public good, are responsible for the status of the great public service corporations of the present day.

This is a history of the growth and an explanation of the existence of the public utilities commission.

WHAT POSITION DO PUBLIC UTILITIES COMMISSIONS OCCUPY IN OUR FORM OF GOVERNMENT?

The position of the public utilities commission in our government today is that of an intermediate body, neither a court nor a legislature, yet endowed with certain legislative or administrative and judicial functions. While it is purely a creature of the legislature, it supplies what neither legislatures nor courts have been able to supply in the growing demand for public regulation, namely, a constant, scrutinizing and often scientific watchfulness over the details of business affected with a public interest. The commission assists the courts in the ascertainment of facts. It assists the legislature by discovering the needs of the community and recommending legislation. It is a body to which any aggrieved individual may go with his complaint, without expense. The commission is not given the power of final determination, however, for appeal to the courts is open to either side. In this respect, and owing also to the opportunity for minute investigation before final action is taken, regulation by commission presents a reassuring elasticity which was lacking under the policy of direct restrictive legislation, where the duty of the corporation was arbitrary obedience and the duty of the courts unyielding enforcement of the laws upon the statute books.

It will be needless here to consider the much mooted question of whether a commission's power to regulate rates is legislative or administrative.[6] A sharp distinction is hardly necessary, for it is often provided that a commission-made rate shall be taken as reasonable until the contrary is shown,[7] or that the action of the commission shall be *prima facie* evidence of the reasonableness of a rate as found.[8] The final determination of the question of reasonableness is for the courts.[9] Nor is the position of a commission fundamentally affected by the absence of rate-making powers, provided it has plenary powers of investigation and recommendation. Corporations today are coming to recognize that their interests and the interests of the public are mutual. Therefore, when an advisory commission after investigation, offers suggestions to a corporation, the suggestions are seriously considered and an effort made to comply with them, especially if compliance will obviate a recommendation to the legislature, resulting oftentimes in burdensome or poorly drawn laws.

That the public utilities commission has already proved its usefulness and has taken its place among the permanent agencies of our government, is implied by Mr. Justice Moody in the case of Knoxville v. Knoxville Water Company, 212 U. S. 1, when he says that "The courts ought not to bear the whole burden of saving property from confiscation, though they will not be found wanting where the proof is clear. The legislatures and subordinate bodies, to whom the legislative power has been delegated, ought to do their part." And it may be truly said that the commissions are doing their part.

WHAT ARE PUBLIC UTILITIES COMMISSIONS DOING?

The methods followed and the results achieved by commissions, depend upon many things, the chief of which are perhaps, their personnel, the laws under which they are created and from which they derive their powers and duties, and the appropriations made by the state for their work.

There is at present very little uniformity in commission methods. Some commissions are well organized, having several departments in charge of trained, well-paid experts, who make inspections and investigations; others have little more than clerical assistants, all inspections and investigations being made by the commissioners personally. Some commissions make exhaustive studies of all complaints presented, often rendering long decisions based upon accurately classified data, sound accounting, expert scientific and legal advice; others settle complaints by informal negotiations through correspondence or conferences with the complainants and the corporations. Some commissions are affected by political considerations; others are above politics. The differences in methods are great and are due to a variety of causes.

Broadly speaking, however, the results achieved by the commissions are strikingly similar. One common result has been a restoration of public confidence through assurances that public service corporations are no longer granting special rates or rebates, or indulging in unjustifiable practices. It has also been shown in many carefully considered cases that all public service corporations have not been making exorbitant profits by charging excessive rates. Another result has been a benefit to the corporations themselves, through the enforcement upon them of proper accounting methods, leading to a better understanding of their own business. Indirectly this has likewise benefited the public. In some states, the creation of commissions has relieved the corporations from the annoyance of regulations by hostile or ignorant munic-

[6]Chicago & N. W. Ry. Co. v. Dey, 35 Fed. 866,874; Siler v. Louisville & N. R. Co., 213. U. S. 175.
[7]C. B. & Q. R. R. Co. v. Jones, 37, N. E. 247.
[8]Burlington, C. R. & N. Ry. Co. v. Dey, 48, N. W. 98.
[9]Reagan v. Farmers' Loan & Trust Co., 154 U. S. 362.

ipal or other local authorities. So, too, corporations have become less and less involved in politics and have been freed from the burden of granting free service or making money payments to political parasites. Much costly litigation has been saved. Better relations with the public have been established by substituting the calm judgment of a public arbiter for the unthinking frenzy of one of its indignant members. Again, the corporations are protected in some states from the economic anomaly of regulation plus competition, through the operation of "convenience and necessity" provisions in recent commission laws. These are some of the more important results of regulation by commission. It is needless to go in detail into the numerous direct benefits to the public through the commisions' routine duties of calling the attention of corporations to the lack of proper service, to careless, improper and inefficient management, to the dangerous condition of equipment, to the need of proper facilities, to the wisdom of adopting modern methods, adequate devices and new inventions.

As an instance of the early results accomplished by the commissions, may be cited a recommendation of the Railroad Commission of Connecticut in its report for the year 1853, almost 60 years ago, urging as a new requirement, "that a lantern shall be lighted and furnished with a reflector of not less than ten inches in diameter, and placed in front of the engine on all trains running in the night season." And after referring to the fact that all the companies except the Stonington Company, required their engineers and conductors to furnish their own watches, and saying that it could hardly be expected that men with such moderate compensation should keep their watches in reliable order, the Commissioners add: "A safer practice would be for the corporation to furnish at least each conductor daily with a watch from the office, known to be right and in order; this he should return to the office for comparison and adjustment, after the duties of the day are performed."

From these early beginnings, the commissions have been slowly but surely working their way into the public confidence and while there are some instances of ornamental uselessness, there are many other instances of far-reaching and important work.

COMMISSIONS WITH JURISDICTION OVER TELEPHONE COMPANIES.

It may be fitting at this time, to say a few words about the commissions whose jurisdiction embraces telephone companies. Only eleven years ago, in 1900, there were but three state commissions with jurisdiction over telephone companies. These were the commissions of Louisiana, Mississippi and North Carolina. Six years ago, in 1905, there were but five state commissions with jurisdiction over telephone companies, South Carolina and Virginia being added. Today there are twenty-seven state commissions with this jurisdiction, as well as the Interstate Commerce Commission and municipal public utilities commissions in Los Angeles, California, St. Joseph, Kansas City and St. Louis, Missouri, and Wilmington, Delaware. More of these commissions are coming, for agitation is rife throughout the country compelling the extension of commission supervision over all public utilities.

The state commissions with jurisdiction over telephone companies are, at present, rather peculiarly grouped in three lines running north and south over the United States. For example, every state on the Atlantic sea-board, with the exception of Maine and Rhode Island, has a commission with jurisdiction over telephone companies. The next line begins with North Dakota and extends due south through South Dakota, Nebraska, Kansas and Oklahoma, to Louisiana. The third line is on the Pacific coast, beginning with Washington and running south to Oregon, Nevada and California. It should be stated here, however, that the Oregon law for the first time in the history of public utilities commission laws, has been referred to the people of the state under a referendum petition, and will not be voted upon until November, 1912. It should also be noted that, although a constitutional amendment has recently been passed in California, providing for a public utilities commission, the Legislature must take action before the commission comes into existence. The other states with commissions in control of telephone companies are grouped about the Great Lakes—Wisconsin, Michigan and Ohio.

SUMMARY.

It has been pointed out that during the Middle Ages economic conditions analogous to those of monopoly, caused certain industries to be affected with a public interest; that to protect that public interest, there grew up the three common law principles of serving all who applied, at fair rates, without discrimination; that these principles were enforced by the courts and enacted into compulsory statutes; that as civilization advanced, monopolistic conditions gradually decreased to such an extent that free competition largely superseded courts and legislatures in the regulation of businesses affected with a public interest; that the system of free competition reached its height during the first half of the nineteenth century; that with the return of monopolistic conditions in certain modern industries the courts and legislatures were again called upon to enforce the equitable principles of the common law; that because of the vast complexity of the new industries, courts and legislatures were unable to deal with them satisfactorily; that at this critical period the supervisory commission was created, with ample powers and always in session; that the first great stride toward regulation by commission came with the establishment of the railroad commissions between 1870 and 1885; that from the railroad commissions developed the public service or public utilities commissions of today, with control over many of the great modern industries and co-operating with courts and legislatures in working out in all their modern refinements and extensions, the early principles of the common law.

Suit for Interconnection

The Sunset Telephone & Telegraph Company has been temporarily enjoined by Judge Miles L. Clifford in the Superior Court from refusing to make long distance connections with the Farmers' Mutual Independent Telephone Company of Bellingham, Wash. The farmers' company had an exchange agreement with the Home Telephone Company of Puget Sound, and when the Bell system absorbed the Home company the contract with the farmer's company was severed.

The farmers' company asserts that it has spent $62,000 in building up its business and that the refusal of the Sunset people to grant it long distance connection will ruin its business.

Problems in Traffic Engineering

By F. P. Valentine*

IN the foregoing sections there have been discussed in a somewhat incomplete way, some of the principal factors entering into the consideration of traffic engineering problems. Each of these factors has involved most comprehensive study, a discussion of which would involve a paper of considerable length. There is a close relation and inter-dependence between them all. The quality of service is affected by all the other factors, and itself has to be considered in connection with each one. To illustrate the complexity of the problems, and to indicate the possibilities in construction application of the principles deduced from their comprehensive analysis, it is proposed to discuss the concrete application of some of the results of the engineering studies of the last few years in the development of a toll operating system and plant.

From the standpoint of the telephone user, the ideal toll service would afford connection with the most distant point with substantially the same celerity as obtains in case of a local connection. The development of a toll operating system should be toward this ideal as far as economically consistent.

The handling of toll business at special toll boards, or at separate positions on the local board, developed for two reasons. While the operating and equipment charges, under a given toll operating method, are fairly constant, the circuit charges increase in weight with the length of haul. In view of the large investment involved in long toll circuits, it was deemed necessary for economical reasons, to make each circuit handle all the messages possible, and it was generally customary to handle such calls on the basis of arranging to have both parties ready to talk before the circuits were put up for the actual conversation. From the

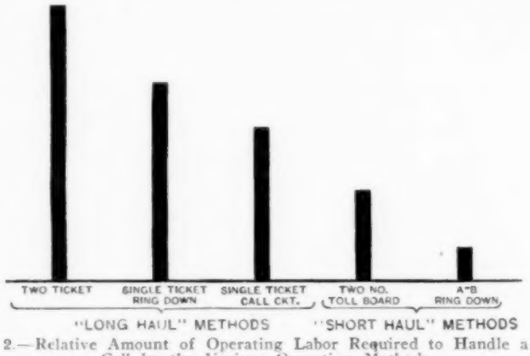


Fig. 2.—Relative Amount of Operating Labor Required to Handle a Toll Call by the Various Operating Methods.

nature of operating procedure involved in handling traffic on such a basis, it was obviously necessary to remove the handling of this type of call, involving extra labor, from the *A* or subscriber's operator, as it would, if handled by the latter, prevent the smooth, quick answering and handling of local connections. Further, on account of the extra labor involved, the productive efficiency of the operator and switchboard were very substantially reduced. It was therefore necessary to specialize and segregate this business. Where the local board was of fair size or an expensive multiple board, it was economical to set up an entirely separate board carrying only the toll circuits, the connection with local subscribers being made through the medium of switching circuits between the boards.

For a clear understanding of the explanation to follow, it will be well to briefly describe some of the most generally used methods of toll operation.

The operating methods employed in handling the toll traffic may be divided into two classes, "short-haul" and "long-haul." In the case of the "short-haul" method the subscriber, who must pass his call by number, waits at his telephone until the called station answers, as he would on a local call. In the "long-haul" method, however, the subscriber, having given his call to a recording operator—specifying a particular party if he so desires—hangs up his receiver and waits for the toll operator to call him.

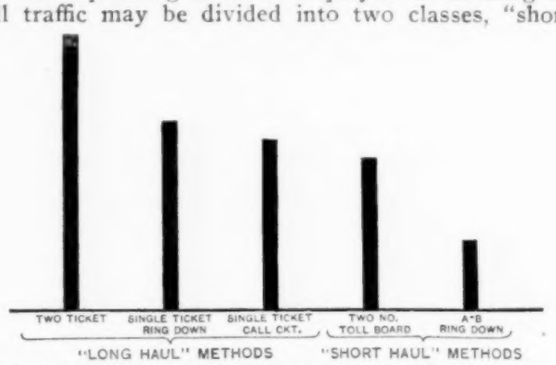


Fig. 3.—Relative Amount of Switchboard Required to Handle a Toll Call by the Various Operating Methods.

Calls of the latter class are further subdivided according to the operating method employed, namely, the two-ticket method, single ticket ring down method, and single ticket call circuit method.

Under the two-ticket method of toll operating the subscriber signals his local operator, asks for and is switched to the toll recording operator, to whom he passes information sufficient to insure the completion of his call, hangs up his receiver and waits to be called. The recording operator having written the necessary information on the toll ticket, forwards it to the line operator, who secures a toll line to the called office, rings, and when the inward operator answers, passes the details of the call, which are again recorded by the inward operator. The latter operator assumes the responsibility of obtaining the particular party; having done this she notifies the outward operator, who thereupon rings the calling subscriber. Both operators supervise and time the call, entering on the tickets the length of conversation and both are responsible for the prompt release of the toll circuits after conversation ends.

The single ticket ring down method of handling a toll call is the same as the two-ticket as far as the recording of the call is concerned and up to the time of passing the call by the outward operator. The latter

*A paper presented at the 28th Annual Convention of the American Institute of Electrical Engineers. Concluded from January.

does not pass the details of the call, but simply the called number to the inward operator, who, without making a second ticket, rings the desired number. The outward operator announces the call to the called subscriber, and assumes sole responsibility of timing and supervising the call, and of releasing the circuits after conversation ends.

The operation of the single ticket call circuit method is similar to the single ticket ring down. It is faster in that the outward operator secures the called station over call circuit trunks to a *B* switching operator in the distant office, thereby eliminating the services of an inward toll line operator.

The "short-haul" methods are subdivided into the "toll board" and the *"A-B"* method.

Under the former, the *A* or local operator receiving from the subscriber the number desired, passes the calling and called numbers directly to a toll line operator, thus eliminating the recording operator as a separate operator. The toll line operator records the call and after ordering the calling subscriber's line to be held on a trunk to the local switching operator, secures the called number as under the single ticket methods of operating.

Under the *A-B* method the toll operator is eliminated, the *A* operator recording the toll ticket and completing the call over a trunk to the distant office. She alone is responsible for supervising and timing the call. This *A-B* method may be on either a ring down or call circuit basis as may be most economical.

There are further refinements of these methods, in the way of "tandem" toll operation, etc., which are purposely omitted from this discussion, as it is impossible to go too much into detail, and the typical methods shown will serve to illustrate the processes described in the following:

Considering first the efficiency of labor involved in handling a toll call, Fig. 2 shows the relative requirements of operating labor under each of the above described methods.

Considering the production efficiency of central office equipment under the same operating methods, Fig. 3 shows the comparison of relative requirements in the way of switchboards and accessory equipment for the operation under each method.

It will be noted that in case of both the central office labor and central office equipment, the "short-haul" methods are relatively more economical than the "long-haul" methods. Bearing in mind that the toll circuit efficiency is affected by many variables, as has been explained, chiefly volume of traffic, length of haul and circuit holding time, it is necessary to consider this factor in connection with the efficiency of labor and equipment. Obviously, to handle traffic on a "short-haul" basis requires more circuits than to handle the same traffic on the "long-haul" basis. It is necessary, therefore, to ascertain under what conditions it will be economical to apply the more efficient operating methods, considering all factors involved.

The process by which the principles deduced from engineering studies are applied to a territory involving a large number of offices of varying sizes and volumes of traffic, may be best illustrated by taking a hypothetical case, as shown in Fig. 4.

A and *B* are fair sized offices 30 miles apart. *C, D* and *E* are offices separated from *B* by 5, 8 and 20 miles respectively. *F* is between *A* and *B* and slightly off the direct line being 24 miles from *A* and 8 miles from *B*. The traffic between these offices is indicated in the table adjoining Plan 1. This traffic is shown in number of calls per day rather than per busy hour, for the sake of clearness. In the actual engineering, the busy hour loads are used.

It will be noted in Plan 1, Fig. 4, that the circuits are laid out in a way generally typical in past practice, the tendency being to furnish direct circuits between points having a fair volume of daily traffic. Under this Plan 1 there are toll positions or toll boards at each of the offices. It will be noted that there are 14 circuits between *A* and *B* divided into several groups, also that there is a fair amount of traffic between *B* and *C* and *B* and *D*, with slightly less between *B* and *D*.

Under Plan 2 the traffic between *B* and *C*, *B* and *D* and *B* and *F*, has been taken from the toll position or toll board and is handled on the local boards on the "short-haul" *A-B* basis. *C, D, E* and *F* continue to handle their toll traffic with *A* on toll positions and over direct circuits. At the right of Fig. 4 are shown the comparative requirements under the two plans. It will be noted that, in order to handle the traffic between *B* and *C*, *B* and *D* and *B* and *F* on a local basis through the local board, additional circuits had to be provided to place this traffic on a "short-haul" basis. This increased the circuit requirements, but made a material reduction in the operating requirements as shown, while the equipment requirements increased slightly owing to the transfer of the toll business to

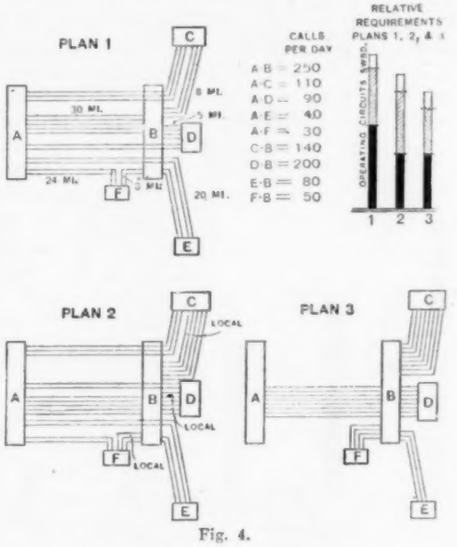


Fig. 4.

the more expensive local board. The composite result, however, is a substantial gain in economy.

Having placed the traffic between *B* and *C*, *B* and *E*, *B* and *D* and *B* and *F* on a "short-haul" operating basis, the way is open for still further modification. Plan 3, Fig. 4, shows the next step, which is the centering of all toll operation for *B, C, D, E* and *F* on the toll board at *B*. Placing the traffic between these tributary offices and *B* on a "short-haul" basis will permit of recording at *B* all toll calls from these points to *A*, practically without loss in time. The operators on the toll board at *B* can order up connections through toll

switching operators at the tributary offices with the same efficiency and speed as with subscribers at *B*.

This plan, which has been termed "toll center operation," has several advantages. Applying the principles outlined in the section on the production efficiency of trunk and toll circuits, by combining into one group all toll circuits between *A* and *B*, each circuit can handle more calls than was the case where they were split into smaller groups as in Plan 1. The offices tributary to *B* receive practically local service with *B* and among themselves. They receive the benefits of the large team of toll operators at *B*, and the net result is a great improvement in the quality of

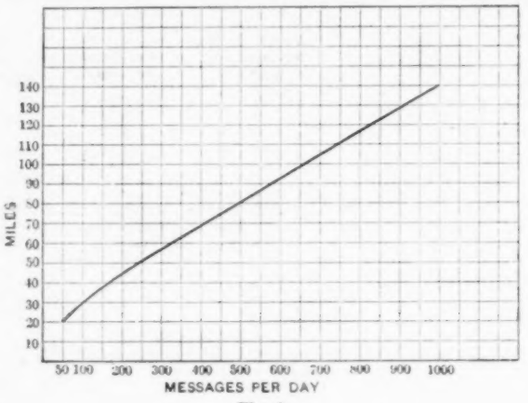


Fig. 5.

service and greater economy in operating and in the use of equipment and circuits, as indicated in comparison No. 3 of "Relative Requirements." It will be noted that the circuits between *A* and *B* have been reduced from 14 to 8, while the total circuit mileage involved under Plans 1, 2 and 3 are 551, 620 and 436 miles respectively.

This hypothetical case illustrates the application of the engineering principles which have been outlined in the discussion of the various factors entering into efficient production. As indicating how substantially may be the results of the application of these principles to a large territory, it will be of interest to state that in the territory of the New England Telephone and Telegraph Company are over 730 central offices, nearly every one of which formerly had its own separate toll position or toll board, although in the smallest offices the toll operation was handled in combination with the local. The application of the above principles has been carried to the extent that today the toll traffic between these 730 offices is handled at 79 toll centers. The general effect on service has been, to place all short-haul traffic on an approximately forty second or better basis; to concentrate the longer haul high-grade circuits in large groups between centers; to concentrate the long-haul toll operation at these centers, with the increased economy and efficiency of a larger and more highly developed toll force; to remove from the small offices the burden of labor entailed in handling toll calls, this resulting in a smoother local service; and, through making available large groups of trunks on main routes, affording a more speedy, dependable long-haul toll service to all offices. Thus by the use of the comparative values established through development of the unit system of equating traffic and the establishment of standards of production efficiency for force, equipment and circuits, it has been possible to improve the quality of service, conserve the investment and reduce operating expenses.

Undoubtedly the most striking development in the analysis of the toll problem is that which has pointed out the way for the evolution and systematic development of the "short-haul" system of handling toll calls.

Reference has been made to the fact that from the viewpoint of the telephone user the ideal toll service would be that which afforded the same speed of connection to a distant point as that given in making a local connection. Having this ideal in mind, studies were made to determine to what extent this type of service could be developed economically. It was demonstrated that laws could be derived from these analyses whereby it could be predetermined, with a given volume of traffic and given average holding time per call, up to what point a suitable number and grade of circuits could be provided and furnish this type of service economically.

It was found essential, in order to furnish this "short-haul" toll service, that the calling subscriber should pass his call for the distant point by number and not for a designated party. This brought out two important factors as requisite to furnishing the means and the incentive to the subscriber for so placing his calls first, the matter of the telephone directory, that the subscriber might ascertain the number desired in the distant place; second, whether the subscriber could fairly be asked to place his call by number and pay for the connection if the distant station were reached, whether his party were there or not.

Investigation of the first factor showed that as the toll calls originated from a comparatively small proportion of the subscribers, where the amount of business warranted, directories for such other places as would meet the needs could be furnished without great expense, or special lists could be made up for subscribers doing considerable business with the distant points.

In case of the second factor, analysis of several thousand toll calls to points at varying distances from the originating office showed that in 89 per cent of the calls where the station was reached, the desired person either answered the telephone or was on the premises and available to talk, and that in 6 per cent more there was some one at the station with whom the business could be transacted. It was thus demonstrated that in 95 per cent of the calls, business could be successfully transacted. It further developed that there was less demand and necessity for locating a particular person on the short-haul calls than on the long-haul calls, which is logical in that the more expensive long-haul toll calls are not usually made unless the matter is of more importance than is the case in the ordinary short haul toll calls.

Based on these results, a plan was developed by which the "short-haul" traffic would be handled on an exclusively "two number-no delay" basis; while for greater distances, the particular person "long-haul" methods would be employed.

This plan has been gradually developed with the result that while in the year 1906 but 17 per cent of the toll traffic of the New England Company was handled on the "short-haul" basis, in 1910 over 50 per cent was handled on that basis, while the plans under development and already partially in effect for 1911,

contemplated that by the end of the year at least 85 per cent of the toll traffic of the company will be so handled. The results so far indicate that the telephone users greatly prefer this type of fast service to the slower "particular person" service and do not find it a serious disadvantage to forego the "particular person" privilege.

It is probable that the New England territory, with its great density of towns and cities, offers ideal conditions for the development of this type of service, but it seems reasonable to expect that the telephone using public generally will eventually express preference for toll service of this character.

As the volume of traffic increases with the growth in the business, it will be possible to offer such service on an economical basis to a far greater extent than would seem possible without a full knowledge of the facts.

It is possible to obtain a view of some of the future possibilities in the development of "short-haul" toll service by examining the chart in Fig. 5.

The curve shown in Fig. 5 is one of a set of curves made up to cover various conditions. The basic assumptions for this curve are the use of No. 12 copper line circuit, common battery type of central office equipment, with standard operating equipment and line production efficiency, and an eight-hour telephone day; *i. e.*, one-eighth of the day's traffic is handled during the busiest hour.

The comparisons are between the generally used single ticket particular party "long-haul" method, and the "short-haul" *A-B* ring-down method. From this chart may be determined, assuming a given number of messages per day, up to what distance it will be possible to furnish enough circuits to permit of operating on the "short-haul" *A-B* ring-down basis more economically than on the "long-haul" particular party single ticket basis. This takes into account all the factors involved that are necessary to a fair comparison.

It would seem obvious that once there is an appreciation of the latent possibilities developed by this analysis, there will be steady progress toward the development of this highly desirable type of service, which can be supplied economically in case of a substantial majority of the toll calls in a territory where there are a number of closely related communities within reasonable distance of each other.

New York Commission News

The Public Service Commission, second district of New York, in its report for 1911, makes an interesting comparison of the speed of telephone operators in answering calls on some of the larger exchanges in the state.

Tests are made by inspectors of the commission as to the time taken by the operators at the central office for performing various operations, and the inspectors are provided with stop-watches and simple apparatus for testing and recording speed and accuracy without the knowledge of the operators.

The tests show the elapsed time between taking the receiver from the hook and the first answer by the operator; the elapsed time between the hanging up of the receiver and the disconnection by the operator so as to make the wire available for another call; and the elapsed time between the closing of one call and the response of the operator for the next call, when several calls are made in immediate succession.

A high grade of telephone service will show an average original answer by the telephone operator in 3½ seconds from the time the call is made; a disconnection, or a clearance of the connection, within 3.5 seconds after the finish of a conversation; and response to a call for another number within 4 seconds. Although only a small part of the complex process of giving telephone service, these operations are practically the only features in which subscribers or the public in general are interested.

The following show some of the results at points where numerous tests were made:

NEW YORK (BELL) TELEPHONE COMPANY.

	Average Answer by Operators. Seconds.	Average Disconnection. Seconds.	Average Recall. Seconds.
Albany	5.5	5	20.6
Buffalo	4.1	4.6	....
Jamestown	3.6	3.8	5.4
Rochester	3.4	9	4.1
Troy	5.2	4	8
Watertown	3.7	2.3	5.3
New York	6.6	...	...

INDEPENDENT TELEPHONE COMPANY.

	Average Answer by Operators. Seconds.	Average Disconnection. Seconds.	Average Recall. Seconds.
Corning	4.5	4.5	4.1
Elmira	3.4	3.1	....
Geneva	4.6	4.7	11.6
Jamestown	3.4	4.0	....
Poughkeepsie	5.3	4.1	....
Troy	4.0	33.0	33.0

The service has been found to be much faster in cities than in small places, as a result of the public demand for speed where business is urgent. The telephone companies have responded to the demand by furnishing the most modern common batter or central energy equipment for the larger exchanges by means of which many of the operations are automatically performed. While the tests show the results of calls actually made at the several exchanges a fair average, representing the usual efficiency of the service, can only be obtained where many tests are made. One bad delay in ten tests would pull the average down and make a poor showing.

It so happened that the tests in New York City were made in the holiday season and mainly at the "Morningside" and "Madison Square" central offices, where inspections were called for on account of complaints made to the commission. The average original answer of 6.6 seconds on 960 tests at tense central offices shows a slow service and is probably unfavorable as compared with the general service throughout the greater city.

The commission has closed upon its records the complaint of the Meridian Telephone Company of Meridian, Cayuga county, against the New York Telephone Company for refusing connection with the lines of that company. A satisfactory disposition of the case was made by the New York Telephone Company arranging for a connection with its lines.

Miniature Portable Telephones

Vest pocket telephones have been introduced successfully in Berlin, Germany. A combined transmitter and receiver set is placed in a nickel-plated case two and one-half inches in diameter and three-quarters of an inch thick. This is readily connected to a public contact receptacle, of which a large number have been mounted on lampposts, walls, pillars, doors, trees, etc. These receptacles are carefully protected from moisture.

What One Woman Thinks

By Sarah Elizabeth Brown

IT ISN'T usual for me to allow anything to "get on my nerves." I have read the dope of the only telephone "financial editor," one of the twenty immortals, for years and years—ever since we have had telephone journals—and I confess to liking his stuff as I like him personally; but he's getting on my nerves! I find myself taking him seriously—almost alarmingly. I mull his stuff with Obediah over the daily meals and only a little while ago I started the palaver at the breakfast table.

Now, a wife with a grown family rarely makes an error like that unless she considers the thing seriously. Breakfast at most well-regulated households is a place for silent communion and to mar the routine with a telephone discussion is to flirt with disaster.

At any rate I ventured and I kept going till Obediah marched out of the house with a sickly smile under his whiskers and no answer. Then I grabbed my faithful scratch-book and relieved myself by getting the subject out of my system.

* * *

This is the burden under which I labor:

Neither competition nor monopoly is based on sentiment. * * * Competition has to be nearly as intelligent as monopoly in order to avoid disaster. * * * Competition is a failure when operated by incompetent hands. * * * I could not help but read with disgust the statement of a past rabid Independent who had sold out, that competition was a failure. * * * I blame the Independent operator greatly for the attempt of the Bell to obtain universal control. * * * Here is where the mistake lies—many men do not believe in government or state or municipal operation of telephones. Yet these same people are forcing the issues on the people. * * * If you object to government ownership, do not sit supinely by and let these mergers go through. * * * Under the present treatment of telephone conditions, municipal ownership is inevitable. I think it will be that way, although materially deferred if men are not afraid. Will you march in line of private telephone progress, or will sickening fear poison your body while you peep through a safe knot-hole at the passing procession?

Where am I at? Is this an invitation to buckle on my armor and fight against the public ownership of telephones, as I have been fighting for competition? Will somebody hear my cry and lead me out of the wilderness? I am the wife and counselor of an erstwhile rabid independent telephone man who wouldn't be satisfied at viewing any procession through a knot-hole—not even a parade of wildcats. He planned the merger of the Bowtop Mutual Telephone Company, when Ben Phelps, its manager, was about to slip it the other way. I told the story nearly two years ago in these pages. Obediah has had competition in the telephone business; both Bell and independent. He judged his competition as being "nearly as intelligent as monopoly"; but it was his eternal problem to make his own business profitable. In the face of this, am I to concede that our patrons would prefer public ownership? If I point to actual instances, I find no examples nearer than Maitoba, where the rates are being raised to care for depreciation. Am I to understand that independent plants are to be worn out in an effort to "materially defer" public ownership, or is this a confession that the depreciation accounts of independent systems need bolstering? Years ago, Obediah adopted our friend's simple rules for depreciation. Has it saved us from this threatened governmental absorption?

I may be fortunate in my position, for I am willing to fight for private telephone progress. I am immune to "sickening fear to poison my body," but I do not know why such preachment must clutter up the records. Men who are instrumental in affecting consolidations should not be denounced as traitors. There are doubtless many of them who prefer to endure the disgust of one writer, rather than suffer the scorn of their fellows and stockholders who might regard them as failures.

I am reasonably sure, too, that a canvass of the country would prove that the telephone public is not ready for, or even thinking about, government ownership of telephones. The government has its hands full right now in trying to do a share of public business. It must learn how to do the things already at its discretion. It must first learn to locate a lost parcel in the mails—something it has been experimenting with ever since I was a little girl.

But I am glad to learn from such an eminent source, that sentiment is not the foundation of the telephone business. If I am not mistaken, some telephone men still think that the independent telephone business is the exception. The printed pages of this book is the best authority I have to offer.

It is seldom that I go up in the air at the things I see in print, but I want to protest that the telephone business should have a new champion for government ownership. The problem would be better served in private hands. I am sure, too, that the knot-hole brigade is pure fiction, for telephone men are courageous enough to fight it out in the open—much as Frank H. Woods, Theodore Gary, N. G. Hunter, Thaddeus S. Lane, B. G. Hubbell, E. H. Moulton, and hosts of others are doing.

* * *

Press reports from all over the country show that independents are opposing mergers with Bell companies and Bell companies are opposing mergers with independent companies. That the Bell buys an independent here and that the independent buys a Bell there. Groups of independents are fighting for this and that, now as ever. They have protested prior to impending legislation; lobbied for state commissions and now implore the commissioners. I fancy the thing will go on forever. It shows to me, more clearly than anything else, how intensely close to human effort the telephone is linked. You seldom find any printed thing that doesn't mention the telephone. I grow enthusiastic when I view a condition like this. I see beyond our own little system, into the tremendous success and activity of thousands of other systems. I delight in being associated with an industry that has fastened itself securely to all human progress and for always and always. No business ever attained greater security and permanency. You couldn't get along till noon without the telephone. And it is the bill you pay as promptly as you do your rent.

Foreign trade balance is in favor of the United States more than a quarter of a billion dollars. Our extravagance cannot be attacked on that score. Our exports exceeded our imports by more than $250,000,000 in 1911. Electrical industries made a better showing on comparative basis than other lines. We are not downhearted. Nor do we care if reminded of the fact that we live well. I take a lot of pride in being able to eat clean, wholesome food and lots of it. I chuckle when I read that as a whole the American people went plumb crazy around Christmas time and blew their heads off buying. It's fun to know that the most of us are not tight wads. Thrift is commendable, but it isn't everything. The banks have oodles and oodles of money and our thirfty people put it there. It takes a lot of self-denial to put money in a bank! But even at that, our extravagant people, who eat better and sleep better than any other, have more savings than all others excepting Germany. A people who can buck the Christmas line as we did a month or so ago, at the end of a year like 1911, are bound to find goal.

* * *

Just for fear the thing might be overlooked, I want to make a note of the newest inventor of the telephone. The item comes from Carterville, Indiana, and the claimant is Harvey Cruzan, now in his seventy-fifth year. Mr. Cruzan claims to have got his inspiration from the scriptures—"the words of my mouth shall be scattered on the winds to the four corners of the earth." He took this cue, studied sound vibration and "talked over a string" by the assistance of some tin cans and a bit of leather. So Mr. Cruzan has joined our old friend Henry Strong in the school of neglected inventors.

* * *

Every little while we get a new thrill that Attorney-General Wickersham is about to pull the mask off the telephone monopolist and make it behave. When the aforesaid Mr. Wickersham is asked about the affair he is usually quoted: "I cannot talk about the matter." It is hardly the province of an old woman to discuss such a weighty problem, but I see so many old women rushing into print that I grow bold. The silliest "old woman" that has come to light recently is Edward W. Bemis; but that is another story. I'll save him for future use.

It is possible, but in my opinion hardly probable that Mr. Wickersham will tackle the telephone right away. To defy the Sherman law you must prove a combination to regulate price; or prove a combination to restrict production; or prove a combination using duress upon its competitors with intent to create monopoly. To get at any one or all of these phases will require a force of experts the like of which has never before made Washington its headquarters. You might have had reason for the belief five years ago, before the state commission was invented to legalize and supervise the transations of public service corporations. Today the absorption of a Bell company by an independent, or an independent by a Bell, is much as it was a few years ago. Every man involved has been awake. Nobody slept. The deals have been effected with eyes wide open. There have been combinations and prices have been raised, usually because the price for service had been too low to permit competing companies to survive. The development of the business has been so rapid that the best of the engineers were fooled respecting growth. We all know that the larger the system, the greater the cost of operation, a rule peculiarly the child of the telephone. Low rates have been regulated by mergers either way. The trouble lies in the lack of impartiality which accompanies the telephone business. There is too much prejudice—too much knocking. It is believed by some that fair-mindedness cannot associate with the telephone. Public service and the public mind are finding common ground. If Mr. Wickersham is itching to tackle a real job he will find the telephone a roaring lion, and when he gets into it he will still find that the lion is king of beasts. I don't believe it will ever be possible to monopolize the telephone business—investigation or no investigation. I've said this so often that I'm having it set to music and will sing it after awhile. I would like to see it harmonized though.

* * *

Speaking of harmony, have you felt that little ripple in automatic circles? Seems as though there is a very sensible movement on foot among manufacturers with out-cropping evidences of real accomplishment. It may be that my tired old mind will find opportunity to contemplate one of the achievements of telephone men with enthusiasm. It is right that automatic telephony be thus favorably received and nurtured. We have had war to the hilt ever since manual telephones were made. The automatic telephone deserves to profit by the experience that has been developed by its forerunner.

* * *

The Continental Telephone & Telegraph Company, of Wheeling, W. Va., around which we have had John A. Howard, alleged millions of English capital, rumors of A. T. & T.'s rival and other thrilling episodes, was advertised for sale January 19. The concern's capital stock of $10,000,000 must be realized upon. One of the advertised conditions of sale required a deposit of $5,000 to be retained by the receiver until sale is confirmed. Among the more prominent persons listed, who were notified of the sale and who are doubtless particularly interested in the outcome, are Max Koehler, five of the Stifels, J. G. Splane, Charles West, A. C. Davis, James A. Brailey, Jr., E. H. Moulton, O. C. Snider, J. J. Heim and H. D. Critchfield.

* * *

About the time that the government is expected to reach out and grab the telephone folks for a shakedown, the press fills up with what Mackay is going to do with the Postal. Can't this stuff clear through some central censoring office? Or wouldn't it be a better plan to keep on sawing wood?

* * *

If you see Obediah at the banquet of the National Independent Telephone Association, find out who bought his ticket. If he did, wire me at my expense. You may recall the grouch he brought home with him last year and his pledge.

* * *

It was a regular little landslide in southeastern Nebraska, wasn't it? When *will* Indianapolis settle down to the real situation? What is this story that is kicking around about Topeka and San Francisco? Really, I'll have to get a private secretary, and an

allowance as well, if I am to keep up this telephone work.

* * *

Did you draw a tick-tock telephone and three emergency slugs? Would it strike you favorably if the gas company slid into your basement at night and installed a 10-25-50-coin meter and offered a card of emergency tokens? I conclude it was rough work for the telephone company, but I'm a long ways off.

Kansas Has Independent Convention

"Proper regulation of the telephone companies in Kansas by an honest and intelligent public utilities commission will be beneficial both to the men who have invested their money and to the public to be served. In the long run justice and fair treatment will result. The state has a right and a duty to regulate not only the service but the cost of the service. The work of the public utilities commission is new, but there is not a shadow of a doubt but that the board, the secretary and the attorney are disposed to be fair and just. The disposition is to go slow, find out what is right and then fight pretty hard to get what is right."

Governor W. R. Stubbs so spoke before one hundred delegates to the Kansas Independent convention which met at Topeka January 9. The governor at the close of his brief talk asked a great many questions about telephone rates in various parts of the state and as compared to other states. These questions were answered by C. W. Myers, who is connected with the Home Telephone Company in Kansas City.

The members of the public utilities commission were also present but did not make speeches. George Plumb, chairman of the commission, announced that the members had concluded to let the telephone companies "iron out" the differences that arise as best they can until some specific case is brought before the commission for decision. E. H. Hogueland spoke briefly to the point that the commission was ready to cooperate with the different managers for the working out of new problems that are constantly arising. John Marshall, attorney for the public utilities commission, told of the operation of the new law as affecting the telephone companies.

The object of calling the meeting was given by W. P. Hemphill, manager of the Topeka Independent Telephone Company, and president of the Kansas Independent Telephone Association. In discussing the matter he said:

"The by-laws of the Independent Telephone Association in the past have excluded all members whose companies have had toll line connections with the American Telephone & Telegraph Company, commonly called the Bell company, or who have been in any way affiliated with that company. There has been a pretty general feeling among a larger number of the regular association members that some action should be taken which would admit any independent company, even if it had Bell toll line connections, in the event that that company was independently owned. The meeting this afternoon was called for the purpose of holding a conference to decide what disposition could be made of their request to become members, in order that they might participate in a general meeting of all independently owned and operated companies, later in the year.

"It would seem that the situation demands the cooperation of all telephone companies in the state, if general conditions are to be improved. Kansas telephone companies are now under the jurisdiction of the Interstate Commerce Commission at Washington and the State Utilities Commission of Kansas, and to comply with their demands, forces upon all exchanges the necessity for broader policies and more cooperation."

The questions asked by the governor brought out the following facts, as given by C. W. Myers:

"The rates in Kansas are lower than in the majority of states. The rates for business telephones in Topeka are lower than in Springfield, Mo., which is typical of other cities the size of Topeka. Long distance charges in Kansas and Missouri are the lowest of any of the states. The governing features in making rates are the length of lines per telephone, and the number of calls per day per instrument. The average earnings of the small companies are imperceptible, as most of the men are novices, in fact the telephone business is practically new and a great many mistakes are made in management. The bookkeeping systems generally in use are very crude. The commission should give some standard form for keeping the records in local offices."

J. D. Joseph, of Whitewater, connected with a mutual company, raised a dissenting voice to the general opinion of the delegates that regulation is the proper thing. Mr. Joseph does not believe in the supervision of the companies by the commission.

A. A. Godard, of Topeka, a director in the National Independent Telephone Association, spoke during the afternoon session, and told how the Bell company was recognizing the rights of the independent companies. Mr. Godard read a letter which was sent out by President Theodore Vail of the Bell company. The Bell people announce that they will no longer try to control the entire field. They will extend toll line connection where no competition exists. Whenever the Bell company buys in an independent line the same facilities enjoyed before will be continued. No special make of equipment will be required and all existing contracts shall continue in force in the event of change in ownership.

Some of those attending were:

F. A. Pratt and George Pratt, Wakarusa; O. M. Anderson, Huron; Samuel Tucker, Pleasanton; J. D. Frost, Perry; J. M. Boatwright, Harveyville; Henry Isaacs, Scranton; A. H. Manning, McLouth; T. L. Youmans, Osawatomie, E. W. Daw, Baxter Springs; W. Jones and C. Bean, Garnett; J. A. Zimmerman, Valley Falls; A. C. McHenry, Meriden; A. B. Clarke, Oskaloosa; L. A. Walker, Parsons; A. B. Barnett, Dodge City; J. D. Joseph, Whitewater; W. P. Hemphill, Topeka; C. L. Brown, Abilene; John Zig, Sabetha; W. C. Palmer, Spring Hill; A. G. Anderson, New Cambria; C. A. Hanson, Assaria; Olaf Larson, Lyndon; J. B. McClenny and W. B. Smith, Oketo; C. W. Parker, El Dorado; J. A. Thompson, Edwardsville; E. R. Ruck, Claflin; T. B. MacKinnon, Tonganoxie; F. M. Campbell, Yates Center; S. E. Parisa, Lansing; J. C. Janzen, Hillsboro; T. Erbacher, St. Marys; E. C. Understock and H. L. Ziegenbeim, Osage City; D. O. States, Buffalo; J. D. Waters, Bonner Springs; W. P. Hayes, Arlington; W. T. Wisecup, Haven; G. D. Nelson, Turon; W. Moxley, Nortonville; Roy M. Clark, Pomona; C. C. Heberlee and H.

M. Randall, Burlingame; R. H. Shove, Winchester; G. J. Schultz, Barnes; O. T. McCandless, Richmond; H. P. Vogler, Waterville; John M. Porter, Melvern; L. O. Norns, Glen Elder; G. W. Shiflett, Caldwell; A. J. Stevens, Hiawatha; U. M. Green, Olathe; T. O. Wilson, Salina; W. W. Finney, Emporia; R. B. Cochrane, Hutchinson; R. B. Gemmill, Abilene; W. B. Reed, Waverly; A. F. Cross, Wilson; Charles Becher, Meriden; H. E. Baker, Overbrook; H. O. Smith, Allen; W. W. Dilworth, Beloit; T. R. Holmes, Independence; A. J. Frederickson, Lindsborg; E. B. Shaw, Gypsum; A. M. Floersch, St. George; C. T. Kimmell, Plainville; J. C. Emick, Miltonvale; S. S. Gingrich, Michigan Valley; L. Bodde, Eastman; U. G. Hannum, Ottawa; Charles Holliday, Lawrence; H. E. Lindas, Great Bend.

Baltimore to Have Meters

In a sweeping decision made by the Public Service Commission of Maryland, the flat-rate telephone in Baltimore business houses is ordered discontinued after May 1 and a meter for the recording of the number of messages ordered to be installed. This meter must be put in at the expense of the subscriber, but supplied by the telephone company.

The decision is a compromise in that, while it upholds the Chesapeake and Potomac Telephone Company in its efforts to abolish the flat rate for business houses, it also secures for the subscribers a reduction from the rate as proposed by the company and insures for them an exact counting of the messages. The saving to the 4,454 subscribers that are affected is placed at $40,000 a year by the commission.

The opinion is an exhaustive one. It discusses at length the investigation made by the commission through its engineer, Charles E. Phelps, and the speeal investigator, Dugald C. Jackson, of Boston. The commission reports that the valuation of property on the part of the telephone company was found to be reasonable. The total value of all property was $5,665,729.74 and the net income $400,169.74, or less than eight per cent on the amount invested.

The telephone rates were found to be unequal, an "inheritance from earlier conditions of the service," Mr. Jackson reported. Some of the flat rate business subscribers were compelled to pay a much higher rate for the same service than others. For two-party line metallic service covering Balitmore and suburbs the rates varied from $72 to $100. This the commission declares to be opposed to general principles of right and justice and contrary to the provisions of the Public Service Commission law.

It is acknowledged that any adjustment of the rates will make some subscribers pay more for the service than they have been paying. But from the report of Engineer Phelps the flat-rate business service cost the company between $35,000 and $40,000 a year more than the revenues from that source. The commission holds that since the company has made money this loss has been made up by those who pay message rates. This makes the real conflict of interests, not between the company and the business public, but between the small number of flat-rate subscribers and the much larger number of those whose service is measured.

On this point the commission decides that the company shall keep on hand a supply of telephone meters which are to be installed upon the demand of the subscriber at the subscriber's expense. Since the meters will add to the expenses of the company, it is deemed neither right nor fair that their cost should be borne by all the subscribers when only a relative few will use them. It is for that reason that the cost is placed upon those desiring meters. While it is stated that a fair charge cannot be determined at the present time, the commission is of the opinion that $3 will be a reasonable one.

Wisconsin Convention This Month

The regular annual meeting of the Wisconsin State Telephone Association will be held February 14 and 15, at Madison, Wis. The headquarters of the association, together with the exhibits, will be in the new Park hotel, which has been re-built and offers the best of accommodations. The convention meetings of the association wil be held in the supervisors' room of the court house. Indications are that there will be from two to three times as many exhibits as there were last year, as the manufacturers and supply houses are taking a very active interest.

The tentative program as prepared by the committee includes:

A paper upon "The Construction of Rural Lines," by E. J. Kneen of Bangor. Mr. Kneen has been in the practical field for many years and his methods are well worth studying.

C. H. Crownhart, chairman of the Industrial Commission of Wisconsin, will speak upon and explain "The Workmen's Compensation Act," and "The Women's Fifty-Five Hour Law," dealing especially with their relations to the telephone companies of the state.

Alonzo Burt, first vice-president and treasurer of the Wisconsin Telephone Company, will speak upon "Service Area or Rate Making."

Mr. Gruehl, Statistician for the Railroad Commission, will talk upon and demonstrate "The Uniform Classification of Accounts for Telephone Utilities and Its Application to the Smaller Companies."

A member of the University Extension Department will speak of the opportunity offered by its correspondence course to the telephone engineer.

Besides the above there will be informal discussions upon "The Different Methods of Handling Collections"; also upon "The Handling, Training and Rate of Paying Operators."

Any needed legislation will be brought up at this meeting, discussed and suggested to the legislative committee.

An Appreciation

"The Spirit of the Switchboard," the full page plate which Telephone Engineer used as a frontispiece last November, was reproduced on the front cover of our contemporary, the *Bulletin Mensual de l'Association des Abounés au Telephone,* of Paris, in its December issue. The *Bulletin* says:

NOTRE NOUVELLE COUVERTURE.

La nouvelle couverture de notre Bulletin mensuel est empruntée au Telephone Engineer de Chicago. La jeune téléphoniste américaine représentée sur cette gravure nous a frappé par sa figure énergique et sérieuse et par l'attention qu'elle apporte a son travail. C'est un excellent exemple pour ses sœurs francaises qui—nous n'en doutons pas un seul instant—apportent toutes le même zèle dans l'exercice de leurs fonctions.

Recent Telephone Patents

By David S. Hulfish

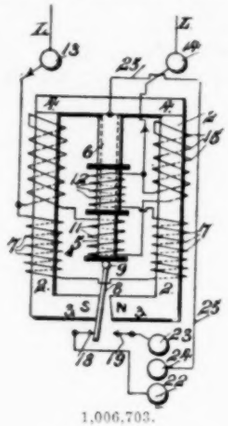
1,006,591. Attachment. Ernest L. Persons, Concord, N. H. An attachment for a wall style of telephone set for holding the telephone receiver in a position suitable to be engaged by the ear of the telephone user. By pushing against the receiver with his head, the user may operate the hook switch of the telephone set.

1,006,615. Central Energy Telephone System. Charles S. Winston, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, of same place. (Filed March, 1906.) A three-wire plug is used, each plug having one relay in the cord circuit and the balancing resistance for the battery bridge being found in the helix of the line relay.

1,006,635. Space Telephony. Lee DeForest, New York, N. Y., assignor to DeForest Radio Telephone Company, of same place. The one claim of this patent is descriptive of the apparatus and reads as follows: "In a space telephone transmitting system, a transmitting antenna, means for developing electrical oscillations therein, spark electrodes in said antenna, electromagnets arranged in proximity thereto, and a telephone transmitter and source of electrical energy associated with said electro-magnets."

1,006,636. Space Telephony. Lee DeForest, New York, N. Y., assignor to DeForest Radio Telephone Company, of same place. In this patent, the system shown has several oscillation circuits for supplying power to the antenna, and a mechanical means in the antenna for modifying the oscillations actually transmitted.

1,006,703. Relay. Arthur L. Townsend, Washington, D. C., assignor of one-half to Albert A. Lohr, Washington, D. C. The object is to provide a relay which will operate its armature upon



1,006,703.

the "break" of the controlling circuit. Two coils are provided for controlling the armature, one of them having a "lag" over the other. The relay shown has polarized pole pieces, and the armature is actuated by two coils differentially arranged, one of them slow acting and the other quick acting.

1,006,833. Telephone Receiver. W. W. Dean, Elyria, Ohio, assignor to the Dean Electric Company, of same place. The patent is for a receiver shell of metal. Both body and cap are of metal, threaded to engage each other, and the body is lined with sheet material, such as thin sheet fiber.

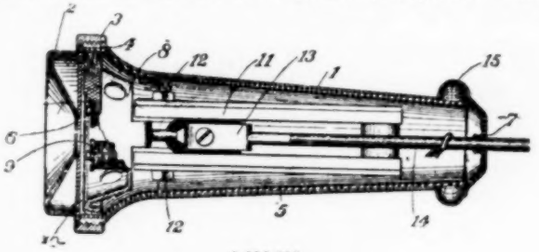
1,007,030. Telephone Transmitter. Albert A. Jahnke, Richmond, Calif., assignor to National Wireless Telephone and Telegraph Company. A telephone transmitter comprising a tube for a fluid stream in the transmission circuit, a speech diaphragm, and means in connection with the speech diaphragm for varying the cross-section area of the fluid stream.

1,007,031. Telephone Transmitter. Albert A. Jahnke, Richmond, Calif., assignor to National Wireless Telephone and Telegraph Company. In addition to the usual electrodes and carbon granules of a microphone transmitter, there are provided channels and chambers for liquid, which is circulated in the electrodes and about the carbon granules at all times.

1,007,036. Telephone System. A. D. T. Libby, Elyria, Ohio, assignor to the Dean Electric Company, of same place. The patent is for a trunk circuit connecting a main exchange with a sub-exchange, and has particular reference to the signals of the trunk line and their operation.

1,007,138. Insulator Bracket. Charles Peirce, Jr., Pittsburg, Pa., assigned to Hubbard & Company, Pittsburg, Pa. A comparatively wide backpiece or plate has a rib, and a metal bracket of bent channel iron engages the rib to hold the bracket rigidly in position. The entire device forms a side bracket for attachment to buildings.

1,007,344. Telephone System. John Erickson, Chicago, Ill., assignor to Automatic Electric Company, Chicago, Ill. This is



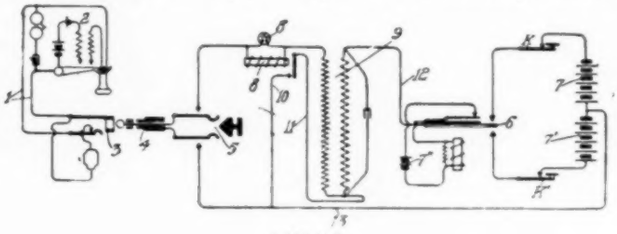
1,006,833.

a lamp signal system for magneto telephone lines, and it comprises a line relay for the magneto line, a line lamp controlled by the relay, a magneto generator at the telephone for charging the relay initially, and a mechanical device for locking the line relay to continue the glowing of the lamp after the magneto ring has ceased. The operation of the cutoff relay releases or unlocks the line relay and thus extinguishes the lamp signal.

1,007,373. Bracket Telephone. William C. Moeller, Doon, Iowa. The entire telephone set comprises a standard for attachment to a desk top, a lazy tongs, and a telephone upon the free end of the lazy tongs.

1,007,575. Telephone System. Henry F. Joeckel, Camp Point, Ill. This system comprises a telephone line with two switchboard drops, each drop connected from one wire to ground, and a number of telephones upon the telephone line each with a grounded generator and a switch to ring with the grounded generator upon either wire of the line, thus actuating one or the other of the two drops, as desired. The system is applicable to a telephone line running into two exchanges, and the stations of the line then may call either exchange without disturbing the other exchange.

1,007,684. Telephone Ringing Device. Harry N. Faris, Kansas City, Kan. A pole changer runs continuously without



1,008,408.

the ringing battery upon its points until current is taken by the switchboard, when the ringing battery is connected by a relay. While the current is taken upon the secondary side of a transformer, the polechanger is upon the primary side and the current furnished to the switchboard is furnished through the transformer.

1,007,741. Line Joint Tester. Henry Harrison Simpson, Pilot Grove, Mo. This is a device for testing line joints from the ground. A pole long enough to reach the line wire has three fingers upon its upper end, and engages the wire with the joint between two of them. The resistance of the wire from the middle finger across the joint to the left finger then is compared with the resistance from the middle to the right finger, where no joint is found, and if the resistance is the same the joint

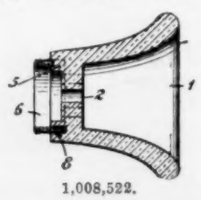
necessarily must be equal to a solid wire for telephone purposes.

1,007,883. Telephone Transmitter. Charles T. Mason, Sumter, S. C., assignor to the Sumter Telephone Manufacturing Company, of same place. The transmitter has a double diaphragm, the back diaphragm carrying the electrode of the carbon button and being connected to the front one.

1,008,122. Telephone Case. W. W. Dean, Elyria, Ohio, assignor to Dean Electric Company, of same place. The telephone in this patent is the Dean metal receiver case, and the claims pertain to the insulating lining of the cap and the means for fastening it in place.

1,008,216. Party-Line Telephone System. Edward Stout and Joseph S. Kupka, Martinsburg, Iowa. Each station has a revolving member and a drop magnet for closing talking and ringing circuits, the station at which the circuit is closed being selected by the position of the revolving member at the moment that the drop magnet is actuated.

1,008,232. Telephone System. Charles S. Winston, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. The system comprises a trunk circuit for operating between two exchanges, the trunk being provided with a specific arrangement of lamp signals and with relays for operating them.



1,008,522.

1,008,282. Selective Signaling System for Telephones. Charles H. North, Cleveland, Ohio, assignor to the North Electric Company, Cleveland, Ohio. In this "inharmonic" system, as the inventor styles it, the frequencies used are 30, 42, and 54, instead of 33, 50 and 66.

1,008,392. Switch Mechanism. George Steele, Tiffany, Summit, N. J., assignor to Banker's Trust Company, New York. A specific arrangement of key parts for a switchboard key of multiple levers and multiple spring sets.

1,008,408. Telephone Ringing Device. Harry N. Faris, Kansas City, Kan. A pole changer in combination with a relay and a battery, operates as a direct pole changer for ordinary ringing loads, but for heavy loads the relay is operated and the device is changed into an inductive pole changer, ringing through a transformer.

1,008,423. Electrical Conductor. Henry K. McIntyre, New York, N. Y. (Filed March, 1906.) An arrangement of conductors in a cable for reducing inductance between conductors.

1,008,452. Selective Signaling System. Vernon Durbin, Brookline, Mass., assignor to Holtzer-Cabot Electric Company, Brookline, Mass. A stepping selector for selecting telephone stations. Impulses of one polarity are used for stepping a rotor, and of the reverse polarity for ringing the bell after the stepping is completed.

1,008,514. Key Mechanism. Ralph W. Armstrong, New York, N. Y., assignor to Bankers' Trust Company, trustee, New York, N. Y. In connection with a number of keys, a common locking device locks any key, and releases all other keys of the group.

1,008,522. Mouthpiece for Transmitter. Frank O. Beuermann, New York, N. Y. The funnel of the mouthpiece, preferably of insulating material, is formed with a groove at the back, and a screw-threaded ring is forced into this groove for the attachment of the mouthpiece to the transmitter.

1,008,880, 1,008,881 and 1,008,882. Telephone Repeating Circuits. Charles Adams-Randall, New York, N. Y., assignor to Randall Telephone Manufacturing Company, Augusta, Maine. Relays are arranged to control the repeating circuits, and are controlled by currents over the telephone lines.

1,009,080. Automatic Switching Apparatus. Frank R. McBerty, New Rochelle, N. Y., assignor to Western Electric Company, Chicago, Ill. The combination with an automatic selector and an automatic sequence switch, of local reciprocal controlling circuits established in the operation of said selector and sequence switch adapted to cause each of them to complete a cycle of operations and return to normal condition.

1,009,134. Telephone Toll Box or Pay Station. George H. Davis, Worcester, Mass., assignor to Livermore Pay Station Company, Portland, Maine. A collector of the general type of the Gray apparatus.

1,009,182. Party-Line Circuit. George Ritter, Stuttgart, Germany. The stations normally have circuit from the two line wires to ground, but take the two lines as a metallic circuit when connected for conversation.

1,009,190. Telephone Trunking System. Charles A. Simpson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. The circuit is specifically for charging the battery of a branch exchange over the trunk circuits from the main exchange when the trunk line is not in use for conversation.

1,009,345. Relay. S. H. Sauve, Denver, Colo. The armature is a free ball, closing a circuit when attracted.

1,009,426. Mold for Electrical Contact Banks. G. W. Lorimer, Piqua, Ohio. The Lorimer contact bank comprises rows of metallic points in a wall of plaster. This patent is for the mold to hold the contact points and form the bank around them when the plaster is poured in.

Illinois Independent Convention

The first session of the Illinois Independent Telephone Association's annual convention opened January 24 at Peoria. Mayor Woodruff started proceedings by talking with Fred A. Dolph, Chicago, over the independent toll line, demonstrating the new order of things in independent telephone circles of Illinois. Mayor Woodruff's address of welcome to the assembled members was answered by President L. Q. Herrick, after which committees were appointed.

The session of January 25 opened with a discussion of the clearing house, which came in for a great deal of praise as a builder of long-distance business. It was the sense of the meeting that all possible assistance should be rendered to perfect it. A resolution in favor of asking an increase of capital was adopted.

In consideration of the early date of meeting of the National Independent Telephone Association at Chicago, the following resolution was passed:

Resolved, That the delegates from the State of Illinois to the annual convention of the National Independent Telephone Association to be held in Chicago, Illinois, the coming month, be and they are hereby instructed and requested to use every honorable means to prevent the National Convention from naming or authorizing any committee, delegate or delegates to confer with or to negotiate with the American Telephone & Telegraph Company, or any of its subsidiary companies, upon any proposition or subject whatever, and that if any such authorization has been given it be immediately revoked.

The following officers were elected for the ensuing year:

President, L. A. Herrick, Freeport; vice-president, W. H. Bassett, St. Louis; treasurer, Theodore C. Loehr, Carlinville; secretary, C. H. Hood, Chicago; executive committee, L. A. Herrick, Freeport; W. H. Bassett, St. Louis; C. H. Hood, Chicago; W. D. Holliday, Jacksonville; C. M. Erwin, Macomb; Ed. D. Glandon, Pittsfield; J. W. Barrett, Pekin.

A banquet was held at 6:30 p. m., Thursday, at the Creve Coeur Club. F. J. Quinn was toastmaster. On the program were "Our Guests," by Leroy Mills, Peoria; "The Public Utility Commission," by Senator John Dailey, Peoria; "State Association," by L. A. Herrick, Freeport; "Live Wires," by C. O. Frisbie, Chicago, and "Lagal Case of Trouble on the Wire," by Fred A. Dolph, Aurora.

In the case of the Juneau Electric Company vs. the New Lisbon Telephone Company, in which the former alleged the latter had so constructed its telephone lines as to injure the service of the petitioner, both companies were ordered by the commission to improve their systems at once, thus avoiding all such interference in future.

Digest of Foreign Telephone Literature

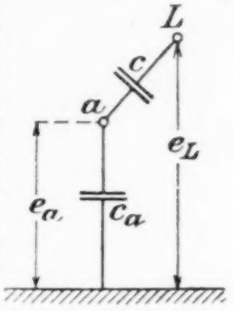
Translated for Our Readers

THE INFLUENCE OF HIGH TENSION CURRENTS ON TELEPHONE LINES.

THE present practice of placing high power transmission lines on the same poles with low voltage wires used for telephone and telegraph work has led to considerable difficulties and troublesome interruptions in service. There are three sources of trouble which are very common, namely: Interruptions through direct electric contact between high voltage and low voltage lines, either by the wires themselves, or often through overhanging branches of trees, kite strings or other foreign matter. Second comes the trouble due to magnetic induction, and third that due to static induction.

The electromagnetic induction is caused by lines of force developing in the line circuits, and these lines of force cutting the low voltage conductor, when they experience any disturbing change. If the return circuit is by way of earth, we must conceive the loop to be formed of the metallic conductor and some conductor placed in the ground. The voltage resulting in the low tension line depends on the current strength in the high power circuit loop, the relative position of the three conductors to each other, and the distance between them. The tension increases with the length of the line and number of periods.

The electrostatic induction is best conceived by taking a high voltage line L with a tension e_L towards earth, and near to a low voltage line a with a capacity c towards the high voltage line, and with capacity e_L towards earth. We will then have the effective voltage e_L near the terminals of the two series-connected condensers c and c_a, and the voltage of the low tension line will be equal to $e_a = \frac{c}{c_a + c} + e_L$.



If we have an alternating current line, we will have a difference of electrostatic potential between the three lines, which will affect the low voltage line to a considerable degree. Here, also, the resulting voltage depends on the position and distance of the lines influencing the electric capacity. It is, however, independent of the number of periods and the length of the induced line.

Since the relative position of the conductors both in magnetic as also static induction is of some importance, we must look for a condition in which this effect disappears. Transposition of the high voltage lines ought to elminate this bad influence on the low voltage lines. But the fact is, that while transposition results in the decrease of the induced voltage, it does not eliminate the trouble entirely.

If we arrange for a return circuit in the low voltage line, both conductors will, in general, be influenced by the high voltage line in the identical manner, i. e., in both the outgoing and the return circuit we will have a momentary tension acting in the same direction. This applies both to the magnetic and the static induction phenomena. The tensions in both conductors of the low voltage line, are, however, equal only when the distance and relative position of the electric and magnetic high voltage forces are equal. The number of periods refers in this case only to the harmonic oscillations of 500 to 5,000 per second, and not to the fundamentals.

If the low voltage circuit loop is in a symmetrical position to the high voltage field of force, we will have no current in the transmission lines which have at any given moment the same magnitude in all conductor cross sections. If we have non-symmetrical connections in the non-induced lines, we obtain an equalizing or compensating current flow through the conductors and apparatus. To obtain the symmetrical position, transposition of the low voltage lines is necessary.

If the insulation towards earth is faulty and imperfect, a current will flow to earth, and may under special conditions flow even through the apparatus connected to the lines. This current in static induction depends on the length of the conductors and the number of periods. The problem of perfect insulation of low voltage lines is, therefore, of great importance.

Most of the disturbances in telephone lines near high tension lines can be traced back to electrostatic induction. The finding of such trouble is usually easy. On the a. c. interurban railway lines from Seebad to Wittingen, using a. c. at 15,000 volts and 500 periods, and changing this current into direct current on the electric locomotives, about 1,600 feet of telephone wires ran parallel to the tracks at a distance of 16 feet away from the high tension wires. Tests showed that the harmonic oscillations of the electric waves resulted in static disturbances, which disappeared in the presence of sine shaped waves.

In the case of magnetic disturbances the remedy is very easy. A telegraph line in Italy over 2,500 feet away from the electric railway line showed considerable disturbance. This was caused by the compensating currents towards earth, and disappeared when the line was changed to the two wire system. The extent of these static induction disturbances is considerable, and at Heimbach it was found that the telephone lines at a distance of 35 feet from the 3,500 volt, 50 periods electric railway line, alternating current, showed an excess voltage of more than 20 volts, which in the event of an occasional short circuit increased to 200 volts.

The points to be guarded in such static and magnetic disturbances are, 1, the danger to the telephone users; 2, the danger to the apparatus; 3, inefficient transmission. One or all of these three disturbances may occur on the telephone line working under these unfavorable conditions. There are some stations where protective devices for the telephone

users are absolutely necessary, where, however, telephonic communication is excellent. In other places the communication is poor, while the induced excess voltages are very small. Protection of telephone apparatus is necessary where there is any chance of direct contact between low and high voltage lines. All instruments connected to lines exposed to such danger are required by German standard rules to have long stretches of insulated wires between the receiver, transmitter, and all parts necessary for handling the instrument, and the current conducting parts, like inductors, microphones, etc. Most of these telephones use well insulated wires for these stretches, except one firm which uses long strips of hard rubber. One very important point is to have all wood parts that have any connection to metallic parts, as hinges, properly insulated and well grounded, even though the wood may have no direct contact with the current conducting parts. If this is not done there is the danger of current being transmitted through the metal hinges or metallic parts to the wood, and exposing the telephone user to an electric shock.

The telephone instruments should also receive careful attention in this respect. In ordinary telephone instruments the safety fuses are in form of power current fuses, which separate the instrument from the current conductor in case of a sudden powerful current impulse. The next safety device is the voltage cut-out, which usually consists of two carbon discs, at no great distance from each other, designed to protect the apparatus against excess voltages. Finally we have safety fuses for weak currents connected just bfore the connections to the telephone instrument, which are to prevent the coils from becoming too hot through the agency of weak currents acting for a long time.

All of these safety fuses and cut-outs are, however, too weak for high tension transmission line work, which has to be taken in consideration in telephone lines run near high voltage lines. The first step in improvement was the substitution of long glass or porcelain tubes as high tension insulators for the customary power fuses. The second important step is to have the lines perfectly insulated, if there is no other means to remove the voltages in the telephone lines, and if the voltage cut-outs cannot be made less sensitive without increasing the danger to the instrument. All curent conducting parts must be placed in such a position that there shall be no great voltage difference between the various parts.

Protection for the coils is afforded by parallel connected vacuum cartridge protectors. The disruptive strength of the coil must, however, be greater than the sensitiveness of the cartridge, as otherwise the spark will prefer to pass by way of the air rather than through the cartridge. Very high excess voltages can be prevented from reaching the telephone instruments, and the coils and cartridge protectors by connecting a power current lightning conductor on the line, so that any high tension current of danger to the apparatus must pass this conductor before it reaches the vacuum protector. Powerfully insulated induction coils with a few windings might be placed between the spools and the telephone instruments, and these will force the excess voltage current to pass by way of the two point lightning conductor.

Another method of protection for telephone instruments is that of transformers. To increase the safety factor, the latter can be provided with a metal layer, grounded, and placed between the two coils. All of these devices are to reduce the danger of line voltage, without decreasing its energy and strength. There are several means, however, to lower the voltage strength. Conducting a grounded wire parallel to the telephone line, whereby the capacity of the line towards earth is reduced, seems to be of little use. The direct connection of condensers between the line and earth seems to give better results, although this method can be used for telegraph wires only, and is useless for telephone lines. Discharge choking coils have really given the best results. The two coils to be connected to the double lines towards earth are placed on the same iron core, and are connected in such a way that only the rectified discharge currents of the two lines, but not the telephone currents, pass over the coils. Water rheostats can also be used for the discharge.

The final problem is that of removing trouble in telephonic transmission. Currents of 50 cycles cause very disagreeable noises in the telephone. If this noise is not too strong it may not interfere very much with communication. More disagreeable is the ringing of telephone bells caused by these currents. These faults are usually due to poor insulation.

Oscillations of 600-1,200 cycles are, however, very disagreeable as they correspond to those of the sound waves used in speech. In one case alternating current at 6,000 volts was transformed in a substation to direct current at 600 volts. The noises in the telephones were caused by the commutators of the rotary transformers and were in form of a low whistling sound which made communication impossible. It was tried to remedy this trouble by balancing or compensating the troublesome current in the telephone lines by means of regulated water rheostats and resistances, choking coils or condensers, and connecting these to earth. This was, however, ineffective. Of equal failure was the connection of the telephone line to the disturbing direct current line, which was tried in spite of the fact that it must seem paradoxical to connect the telephone line with the line which causes all the trouble. But this also proved useless. The reason for these failures, practically, though they seemed possible of remedy theoretically, was the fact that it is very easy to regulate the strength of the current necessary for compensation, while it is very difficult to regulate the current phase. Both factors must, however, have the right value to give good telephone service.

Recent practice has favored placing condensers of very small capacity on the lines, and attaching the telephones with the condensers between the line and the terminal wires leading to the instruments. The telephone currents will then pass these condensers by reason of their high frequency, while the bothersome currents of low frequency will be kept back. This method was tried some six years ago in Italy with great success. It is of course presupposed that the high voltage line has a low frequency. The harmonic oscillations which prevent clear communication are not eliminated as easily, and are not weakened by these condensers, so that the condenser method does not meet every requirement. The best way in any of these problems is to attack the same from the high voltage end of the line, especially if the trouble lies in harmonic oscillations. This was the case in the

line mentioned before, where the noises were caused by the high tones and vibrations of the commutator motors in the electric locomotives. These noises were eliminated as soon as the motors were enclosed.

In other cases of trouble it is often possible to eliminate the same by bringing the lines into electric equilibrium or balance. For this purpose, one line was subdivided for a certain distance into smaller sections, each of which was balanced by proper wiring and transposition methods.

The best method which will avoid all disturbances is the use of cables for the telephone wires. A test at Heimbach with a telephone cable suspended from the high tension insulators showed that with the grounding of the lead sheath of the cable no excess voltages or troublesome noises occur. But even here great care must be taken to have the cables properly insulated.—*Elektrotechnische Zeitschrift.*

THE QUESTION OF TELEPHONE SYSTEMS AND THEIR ECONOMY.

The question of the proper system in installing new telephone exchanges has become one of great importance, more so since there is the choice between the central battery system, the semi-automatic and the automatic systems. It will therefore be of interest to see a comparison made between the various systems from the efficiency and the economy standpoint.

As all of the systems are thoroughly familiar to the telephone engineer, it will not be necessary to describe them, and we can go directly to the comparison. We have here first of all the ordinary central battery systems. Take an existing exchange of medium size, for 10,000 connections, costing about $212,500. The annual amount to be set aside for interest and depreciation is $31,625. The exchange in Amsterdam, which is here taken as a standard, employs about 145 telephone operators, whose wages are about $31,250 per year. The repairs and operation of the exchange will add up to about $15,000. Summing up we have:

Interest and depreciation	$31,625
Operators' salaries	31,250
Operating expenses and repairs	15,000
Total	$77,875

The second is the distributing system of the Aven type, which is not very common in Europe, and is only used in a few cities, among them Rotterdam. A 10,000 subscriber exchange would cost about $275,000, which would make about $41,250 for interest and depreciation. This exchange at Rotterdam used only 7,800 out of the 10,000 possible connections, and used 115 operators to answer calls. The salaries of these operators amounted to $34,000. The operating and repair expenses for the service were found to be equal to $1.50 per subscriber, which would make the sum for 10,000 subscribers equal to $15,000. Summing up, we have:

Interest and depreciation	$41,250
Operators' salaries	34,000
Operating expenses and repairs	15,000
Total	$90,250

In the semi-automatic system the equipment of the subscribers' telephone station is the same as in the other systems, and the difference enters at the exchange, where we have the same outfit as in the automatic system with the addition of an impulse sender. The initial costs for a semi-automatic exchange are therefore the same as those of an automatic station plus the cost of the impulse senders. The operating expenses are the same as those in automatic systems, plus the wages of the operators. The cost of installing a 10,000 subscribers' exchange is about $393,750, which applies to the Strowger system. The interest and depreciation figured at 15 per cent would amount to $59,062. There would be 111 telephone operators at an annual expense of $23,000. Operating expenses would be about $37,500. Summing up, we have:

Interest and depreciation	$ 59,062
Operators' wages	23,000
Operating expenses and repairs	37,500
Total	$119,562

The automatic system of the Strowger-Siemens type for 10,000 subscribers would cost $482,875. At the rate of 15 per cent the interest and depreciation will be $72,432. The operating expenses and repairs connected with exchange and subscribers' telephones will amount to $36,500. Summing up, we have:

Interest and depreciation	$ 72,432
Operating expenses and repairs	36,500
Total	$108,932

The operating expenses total up to the following amounts in the various systems:

Common battery system	$ 77,875 per year
Aven distribution system	90,250 per year
Semi-automatic system	119,562 per year
Automatic system	108,932 per year

The next question of importance is which of these systems can reduce its operating expenses and at the same time retain its maximum efficiency. All of the systems suffer the disadvantage of comparatively slight use of the equipment and great irregularity of service on the part of the subscribers. Especially the latter evil, which is due to the business conditions in larger cities, is unavoidable, for in every city there will be times during the day when the demand on the exchange is very great, while at other times it is at a minimum. The slight use of equipment is also hard to remedy and depends again on local conditions. It therefore makes no difference as far as systems are concerned which one is used.

The automatic system might be said to have the advantage of wide distribution and subdivision. But this is also limited, for after the telephone lines have once been laid it is not possible or, at least, very expensive to distribute the telephones over a very large area, away from the exchange and the main feed cables. Again the automatic system necessitates constant supervision and repairs, so that it is in the interest of the exchange to concentrate the telephones in as limited an area as possible, and the possibility of very extensive exploitation of existing equipment is at the same level as in the other systems.

We must, therefore, turn for the solution of this problem to the exchange. Here we have first the calling relay, which lights up a lamp at the telephone switchboard when the subscriber removes his receiver. The wear and tear on this lamp is so small that it cannot be considered. Quite another case is that of the contact which closes and breaks the circuit to this lamp. This contact is free as soon as the call lamp has lighted and is therefore at the disposal of any other subscriber who wishes to call. At the present time in the common battery system, each subscriber

has his own relay and contact. It would, however, be possible to use one contact for a group of subscribers, and if we were to combine 50 or 200 subscribers into one group we would need only one calling relay and contact instead of 50 or 200 relays. The question which is closely connected to this wear and tear problem is that of current waste, for at the present time, when one subscriber is answered by the operator, the other subscriber, who may be waiting for an answer, uses current, which is really a waste, until central takes his number and makes connections for which he pays. Instead of the large number of relays which lie inactive half the time we would have a small number of very active relays, which would use comparatively little current, and would still meet the requirements of the subscribers. This would bring with it a saving in space at the exchange and a similar saving in equipment and expenses. The next point of discussion is that of the jack panels. These are in large numbers in every exchange and are used to a very small extent. These have been somewhat eliminated by the distributer system, where the calling subscriber automatically calls on a telephone operator who is not very busy, and who can obtain the desired number. It is even possible to do away with the distributing operator at the exchange as is the case in the semi-automatic exchanges, where it is the subscriber who selects the telephone operator whose wires are not busy at the time he calls. The automatic selection of operators necessitates a number of call lamps for each subscriber, depending on the frequency with which he uses his telephone. The very fact that the subscribers distribute their calls over a larger area, relieves the congestion and increased demand on certain operators and increases their efficiency by not overburdening them with calls at one time.

Such a plant as described in the above lines would work in the following way: The subscriber removes his receiver, and in the space of ½ second his call is answered by any free telephone operator, called by the automatic selector system, which lights up any of the lamps not used at the respective switchboards. The operator answers the call in the usual manner. As soon as the call is made by means of the jacks and plugs, the calling and selecting contacts are released and are ready for the next subscriber. At the moment when the operator answers the call, the approach to that switchboard is barred and an incoming call is sent to some other board with a free operator. Each of those calling devices is used about four seconds for a call, so that fifteen calls can be answered in one minute, making 900 calls per hour.

Looking now at this question from the operator's standpoint we find that one of the greatest troubles in telephone service, namely the overburdening of certain operators, is avoided. Since every operator has only to attend to one call at one time, the nervous strain to which she is exposed in other systems during rush hours is eliminated, her efficiency is kept equally high at all times, and her nervous eneregy is not taxed too much. The advantages of this system in this direction might be summed up as follows:

1. Equal load on all the operators.
2. Highest efficiency of every operator with the least strain.
3. Every call received at the exchange takes a minimum of time and leaves the exchange free for other calls.
4. No subscriber has to wait for an answer due to the operator being busy with one or more other calls at the same time.
5. Impossibility of the operator's giving preference to one or the other of the subscribers, and thus showing favoritism.
6. Impossibility of an operator trying to "punish" some subscriber by delaying to answer his calls.
7. No subscriber can find out which operator is accustomed to answer his calls.
8. Possibility of following fluctuations in service and demand on the exchange by watching the number of operators kept busy with calls.

At night the switchboards are connected in such a way that the calling subscribers call only at certain boards where the night operators work. This avoids the possibility of calls being spread over a large area of switchboard space and relieves the work of the night operators. As this system would do away with the distributing operators, who distribute the calls to the wires of "non-busy" operators, we have a considerable saving in expense, in addition to better service and less strain on the operators. The operating expenses for such a system would be the following, figured for a 10,000 subscribers' exchange:

Interest and depreciation	$23,438
Operators' salaries	22,675
Operating expenses and repairs	15,000
Total	$61,113

—Zeitschrift für Schwachstromtechnik.

More Grouping of Bell Licensees

Announcement is made that an operating amalgamation of the Bell telephone interests in nine southern states is contemplated by the directors of the companies involved. The proposed change is in line with other recent changes for greater economy and efficiency made by the American Telephone and Telegraph Company, and embraces the creation of a new operating district.

Should the plan be approved the Southern Bell and Cumberland Telephone Companies will be operated as a unit, with W. T. Gentry of Atlanta, now president of the Southern Bell Company, as president of both companies. James E. Caldwell, president of the Cumberland company, it is reported, will become chairman of the board of directors of the Cumberland. The disposition of minor officials of the companies involved will be determined later, but there probably will be no drastic changes.

The present territory of the Southern Bell Company, with the exception of Virginia and West Virginia, and the entire territory of the Cumberland company would thus be placed under one operating head, who would direct telephone affairs in the Carolinas, Georgia, Florida, Alabama, Mississippi, Louisiana, Kentucky and Tennessee. It is planned to place Virginia and West Virginia in a new operating district, consisting of those states, Maryland and the District of Columbia, with M. H. Buehler, formerly of Pittsburgh, as vice-president and general manager, with headquarters at Baltimore.

No time has been set for the operating amalgamation of the Southern Bell and Cumberland companies, but should the plan be approved it would probably go into effect about February 1. Both companies are controlled by the American Telephone and Telegraph Company, and it is planned to have each retain its present corporate form, the change being desirable solely from an administrative and operating viewpoint and to bring about greater efficiency.

The Law and the Telephone

By E. J. Wenner

TELEPHONE COMMUNICATIONS—ADMISSIBILITY OF TELEPHONE CONVERSATION AS EVIDENCE—ACTION ON CONTRACT MADE BY TELEPHONE CONVERSATION.

WILLIAM H. GARDNER was engaged in the retail millinery business in Minneapolis, Minn., and for a number of years had procured insurance on his stock of goods from defendant, who was an insurance broker. Both plaintiff and defendant had telephones in their respective offices and frequently plaintiff had ordered insurance by a telephone communication.

In July, of 1910, plaintiff called defendant's office by telephone and ordered a $600 policy of insurance to cover his fixtures. The telephone was answered by a lady, as had been done on previous occasions, and within the usual time the policy was delivered to plaintiff. Upon examination, however, it was found the policy covered stock instead of fixtures. Plaintiff called defendant at his office by telephone and the lady in charge was informed of the mistake in the policy, and she was asked if she had authority to take an order for the insurance. She informed him that she could do so and it was arranged that the policy should be immediately changed and an additional amount of $1,500 insurance should be placed upon the fixtures. To make sure the order was properly placed, plaintiff had the lady repeat it to him over the telephone and again re-stated it to her.

Within a few days plaintiff left for New York upon a business mission, and a few days after his return a fire occurred which destroyed his stock and fixtures. Upon investigation he learned the $600 policy had not been changed and that defendant had neglected to write the additional insurance of $1,500. The $600 policy upon the stock was paid in full. Plaintiff lost the additional protection of $1,500 and upon the theory that the order had been accepted and that same was a contract between himself and defendant brought action for its breach. Plaintiff was given a verdict in the court below and defendant appealed to the Supreme Court.

In its opinion the Supreme Court calls attention to the following language found in Gilliland v. Railway Company 85 *South Carolina* 26: "One who answers a telephone call from the place of business of the person called for, and undertakes to respond as his agent, is presumed to speak for him in respect to the general business carried on by such person at that place." Gilliland v. Railway Company., 85 *S. C.*, 26, 67 *S. E.*, 20, 27 *L. R. A.* (N. S.) 1106, 137 *Am. St. Rep.*, 861.

The above rule, however, does not apply where a particular individual is shown to be charged with an admission or conversation over the telephone. In such case identification of the individual must be shown.

Citing Reed vs. Railway Company, *72 La.* 176, the court observed that a principal, having adopted the telephone for use in the transaction of his business, should be held accountable for the conduct of those, who in his absence speak for him, especially if the conversation is carried on with one who represents himself or herself to have authority to transact the business in question.

The court did not believe such a broad statement governed the facts in this particular case and made use of the following language in disposing of the proposition stated:

> A consideration of the question is not necessary to a full determination of the right of the parties. It appears from the record before us that for several years business of the character here involved had been carried on and conducted over the telephone between the parties, the plaintiff had a line of credit with defendant, and that orders for increased insurance thus given, and received at defendant's office either by himself or some lady clerk, with the exception of this instance, were uniformly filled and carried out by defendant. Plaintiff on this occasion inquired for defendant, and, upon being informed that he was absent, asked if the person speaking had the right to take an order for insurance, and, upon being informed that she had, communicated the same to her, and dismissed the matter in the belief that his order would be filled as like orders had been in the past. There can be no question on the evidence but that this conversation was had with Miss Johnson, a clerk in defendant's service. The order included a change in the $600 policy and a new one for $1,500. Miss Johnson admitted on the witness stand that she received the order for the change in the first policy, but denied that part having reference to the new one. Only one conversation between plaintiff and defendant's place of business was had at the time upon this subject, and either plaintiff or Miss Johnson is mistaken as to its purport. The jury placed credit with plaintiff. This witness, as stated, was a clerk in defendant's employ. She was authorized to answer telephone calls, to fill out policies of insurance, and otherwise assist her superior, Mrs. Grosskopf. Defendant offered evidence tending to show that she possessed no authority to make contracts for him; or to accept or receive orders for insurance over the telephone or otherwise. But it also appears that upon this particular occasion she was the sole occupant of defendant's office, and assumed the right to take this particular order. There was also evidence to the effect that, after plaintiff had suffered a loss by fire, defendant admitted that Miss Johnson received the order for the additional insurance, but neglected to report the same, hence the failure of defendant to procure it. Presumptively, within the authorities cited, Miss Johnson was authorized to act for defendant, and though we do not hold the presumption conclusive, as creating apparent authority within the law of agency, we do hold that the evidence, taken as a whole, made the question of her authority one of fact for the jury to determine. The truthfulness of the testimony of defendant respecting restrictions imposed upon her was a matter for the jury, and we discover no reason for interfering with their conclusion. It follows that the verdict should be sustained, unless the further contention of defendant in reference to the charge to the jury presents reversible error.

The trial court instructed the jury that if Miss Johnson had authority to make the contract they might find for the plaintiff, if the evidence further showed it to be her duty to answer the telephone and to communicate messages or orders to the defendant. This instruction, however, provided that such should be the law only in case she failed and neglected to communicate with her employer.

The Supreme Court held such an instruction permitted a recovery on account of the negligence of the clerk, who might not have had the authority claimed, and decided that the defndant would only be liable if it was shown Miss Johnson had authority to accept such an order. If she did not have such authority her attempted acceptance was not binding upon the de-

fendant and no binding or legal contract resulted therefrom.

The instructions complained of permitted a recovery upon a ground not involved in the pleadings in the case and for that reason, if for no other, were erroneous.

The case was remanded to the lower court for a new trial.

VALIDITY OF FRANCHISE—NECESSARY THAT STATUTORY REQUIREMENT BE FOLLOWED—METHOD OF GRANTING FRANCHISE.

Early in the year 1898, Iowa Telephone Company entered into negotiations with the officers of the town of Washta, Iowa, looking toward obtaining a franchise for the establishment and operation of a telephone exchange in the town. An ordinance granting such a franchise was prepared and introduced into the town council, and the Iowa Telephone Company and its successors claim such ordinance was duly passed and became effective on May 16, 1898.

The city records show a meeting of the town council on May 16, 1898, and that under suspension of the rules the ordinance containing the resolution was passed on its first, second and third reading. A further motion that the ordinance be finally and fully passed is shown of record.

A further record shows a special election to have been held on August 5, 1898, on the adoption of the franchise and that twenty-nine votes were cast for it and none against it.

Acting under the purported franchise, Iowa Telephone Company constructed a toll line into the town of Washta and made no effort to construct an exchange. On October 1, 1907, Iowa Telephone Company executed to F. L. Cooper a lease for the use of its exchange located in Washta, together with the right to exercise the franchise claimed to have been granted it. Early in the following year Cooper made an effort to assign all his rights under said contract, lease and purported franchise to Farmers' Telephone Company, of Quimby, Iowa.

Farmers' Telephone Company undertook to establish and install a telephone exchange, and after some interference on the part of the town of Washta brought an action and procured a temporary injunction restricting the said town and its officers from interfering with the erection and construction of the said exchange. The defendent did not deny the granting of the claimed franchise and alleged the action of town council and the special election to be illegal and void, and the franchise to be invalid on that account.

That statutes of the state of Iowa require the yeas and nays to be called and recorded on the passage of a franchise, and declare that no franchise shall be granted by any municipality unless a majority of the electors vote thereon at a general or special election. The town records do not show the calling of the yeas and nays, nor do they show the publication of necessary notices of the calling of a special election. In the absence of such showing a franchise is illegal and invalid and no presumption arises to favor its validity. No presumption that the statutory requirements were followed can be indulged in. The franchise in question is invalid. Farmers' Telephone Company vs. Quimby, Iowa vs. Town of Washta, 133 *N. W. Reporter* 361.

South Dakota Convention

The annual convention of the South Dakota Independent Telephone Association was opened January 18, by an address of welcome by R. P. Funk, who represented Mayor Burnside of Sioux Falls, and the response was given by Judge C. B. Kennedy. The main question under discussion was the proper compensation to a local company for handling toll messages and steps were taken for bringing this matter before the state railroad commission for adjustment.

In his annual address President A. S. Hall, Redfield, stated that the last session of the legislature had amended the law fixing the terminal fee to the local exchange at five cents for each long distance message, that the railroad commission may allow a higher rate. This fee Mr. Hall considered insufficient and recommended that action be taken to bring the matter before the commission. He also recommended that the date of the convention be changed to a more favorable season.

Dr. E. R. Buck, Hudson, secretary, gave a brief review of the history of the association which dates from 1903. He gave the association the credit for being the first to advocate physical connection and cited an instance where the Iowa association refused to print a paper presented to that body at Cedar Rapids several years by the president of the South Dakota association, in favor of this law.

At the invitation of the president, who was unable to be present, Franklin H. Reed, Chicago, gave a talk on the National Independent Telephone Association.

A committee on toll rates, composed of Alli Reed, C. B. Kennedy, A. E. McMillan and J. A. Steninger, made its report at the opening of the session on Thursday morning and recommended that the following subjects be discussed by the association:

That the five-cent terminal charge allowed by law should be added to the message rate.

That on originating business the exchange be allowed a commission of ten per cent on the toll message fee.

That settlements be made by records kept, and not by collections made.

The last subject, especially, led to an extended discussion which developed a difference of opinion, some expressing the belief that it would be both unfair and detrimental to the business to settle on any other basis than collections. However, the report was adopted and a committee composed of Messrs. Hall, Kennedy and Hartwell was appointed to represent the association in the presentation of this matter to the railroad commission.

F. D. Smith, Sioux City, Iowa, discussed at some length how telephone companies operating in small towns might also conduct an electric lighting business with profit. "The Future of the Telephone" was the subject of a very interesting talk by Alli Reed, of Vale. Papers were also presented by Theo. Holein, J. A. Steninger and others.

The following officers were elected: President, A. S. Hall, Redfield; Vice-President, J. A. Steninger, Parker; Secretary-Treasurer, E. R. Buck, Hudson; Executive Committee—A. Reed, Vale; F. B. Rowe, Pierre; P. C. Cockerel, Sioux City; M. B. Rvan. Beresford; District Vice-presidents—H. P. Hartwell, Irene, first district; J. Wilson, Groton, second district; A. Reed, Vale, third and fourth districts.

California's Broad Commission Law

As per recent amendments to the state constitution, the legislature of California, in special session, passed a law providing for a state railroad commission composed of five members, defining its powers and duties. The bill, which is technically known as the Railroad Commission Act, sets aside the railroad commission law passed at the last regular session. The new law becomes effective in ninety days after adjournment of the special session, if signed by the governor, which action is already assured.

The bill, which is modeled after the public utilities measures of New York and Wisconsin, but is said to be even more comprehensive than any in the regulation of state utilities, was drafted by a committee appointed at the governor's legislative congress held in San Francisco and was composed of the following: J. M. Eshleman, president of the State Railroad Commission; Max Thelen, attorney for the commission; Senators L. G. Burnett, L. R. Hewitt and J. W. Stetson; Assemblymen Arthur Joel, C. L. Preisker and W. A. Sutherland.

According to the new law the State Railroad Commission is increased from three to five members, appointed by the governor, with a salary of $6,000 each per annum. The power of the commission has been extended to include all public utilities which, according to the bill, include every common carrier, pipe-line corporation, gas corporation, electrical corporation, telephone corporation, telegraph corporation, water corporation, wharfing and warehouseman.

The commission has the power to fix rates for service, to regulate the standards of equipment and service, to review all stock and bond issues offered for sale and to see that funds so derived are invested as stipulated. It also has authority to annul bond issues upon evidence of fraud or possible injury to investors, and to prevent over-capitalization. The bill denies corporations the right of appeal from the commission's ruling on writs of certiorari. It provides that such appeals may go before the Supreme Court only on questions of law and not of facts, the latter to be determined solely by the commission, which may adopt its own procedure in taking testimony and is not governed by rules of evidence.

Ohio Commission News

The Ohio Public Service Commission in the case of Denny Cross against the Central Union Telephone Company, in which failure to pay for the month of December resulted in discontinuance of service on the 18th, has decreed that companies cannot terminate service to subscribers at will, but must frame a set of rules for their guidance in such action, said rules to be incorporated in the contract. The fact was brought out that the only rule the company has regarding the payment of bills is that a discount is allowed for payment before the 10th of the month. Failure to pay usually resulted in discontinuance of service about the 18th of the month, but this was shown to be merely a matter of practice and not governed by any definite rule or contract. The commission ordered the service restored in this case, pending settlement of the difficulty over the account and the company was informed that a set of definite rules and regulations must be put in use before discontinuing service for any cause.

The commission has recently been investigating the manner of financing public service corporations in the past. As the result of the loose manner in which this has been done the commission found that in some case there are large amounts of outstanding securities that contributed only a small amount to the construction and improvement funds; still these must be taken into consideration when applications are made for new issues. Under the old method bonds were sold at a discount and stock was given with them as a bonus. Interest and dividends had to be paid on the full amount of these securities, while they in reality contributed to the good of the corporations and the people they serve nothing above the actual cash received for them.

As far as possible, the commission has planned to base its action upon the figures of securities at par, but, of course, there are cases where this cannot be done. For example: A company desires to issue bonds for improvements, but a large part of its stock has been given away as bonuses. Because of the urgency of the case the board is forced to allow the issue.

Henceforth all new incorporations will be required to sell their securities at par, and every dollar thus realized will go into the construction and will insure a safe basis for operation and also a safe basis for estimating rates for the service. As the commission is of the opinion that this could be brought about better through an act by the legislature it is probable such legislation will be sought.

A decision recently rendered by the Circuit Court is one which will interest public-utility corporations throughout Ohio. The Tiffin Art Metal Company brought suit against the Tiffin Consolidated Telephone Company to prevent the collection of rates higher than those fixed by the council. The injunction was granted by Judge Duncan of the Common Pleas Court. On appeal, however, the Circuit Court dissolved the injunction, holding that municipal corporations do not have the authority to fix rates.

Vermont Commission News

Following a hearing on a petition of the Orange County Telephone Company against the Royalton Power Company and Rapid Telephone and Telegraph Company setting forth the unsafe conditions existing between the villages of Chelsea and South Royalton, because of the close proximity of telephone and high-voltage electric wires, the commission placed an expert in the field with instructions to make careful investigations and report results. It was found that for several years the telephone companies have maintained separate lines along the highway between the villages above mentioned; that in some places the poles and wires are on the same side of the road and in other places on opposite sides; and that the Royalton Power Company proposed to construct a line along the same highway to carry electric current of high voltage for power and electric lighting. As the three lines would greatly interfere with each other and with public safety as well as with proper service the Royal Power Company was ordered so to construct its lines that they should not parallel the lines of either of the telephone companies nearer than fifteen feet and in case such conditions already existed the power company was ordered to move the wires

of the Orange County Company to the poles of the Rapid Company and the expense of such transfer should be apportioned among the companies. Where the wires of the Power Company cross the wires of the telephone companies, specified construction shall be used.

In future construction in this section where the high-potential line is involved telephone companies are asked to place their poles and wires on the same side of the road, thus avoiding crossings with the power line and for the same reason two telephone companies should use the same line of poles, on the basis of some rental agreed upon.

Oklahoma Commission News

The Oklahoma Commission has issued a tentative order to the telephone companies of the state proposing that preference be given over other business to calls put in by certain state and district officials, when these officers state it is urgent official business. The officers mentioned in the order are the governor, members of the Supreme Court and Criminal Court of Appeals, attorney general, corporation commission, adjutant general, district judges and sheriffs of the various counties. The matter will be taken up for consideration later.

In the case of the Burroughs Oil Company against the Pioneer Telephone Company, Oklahoma City, the commission decided against the telephone company and the latter has appealed to the Supreme Court. The whole matter rests on the question of whether the original franchise granted the Pioneer company is a binding contract so far as the rates fixed by it are concerned. The suit was brought about by the increase of rates on the part of the telephone company.

Postmaster Wants U. S. to Own Telegraph

Postmaster-General Hitchcock, January 15, gave out a statement saying he would recommend to congress government ownership and operation of all telegrapn lines. It developed that Mr. Hitchcock had brought the subject to the president's attention a year ago, but to make a complete investigation there was a delay. Mr. Hitchcock had intended to bring the matter up again in recent cabinet sessions, but press of other business prevented.

The statement given out at the white house follows:

A recommendation by the postmaster-general that it would be well for the government to buy the telegraph lines and incorporate them into the postoffice system appeared in an earlier annual report submitted by him to the president. After some discussion, it was decided, at the suggestion of the president, to postpone reference to the matter to another year and not to bring it forward then because of the recommendation of many other important changes, including the postal savings bank and the parcels post. These, if adopted, would take up all the energy of the postoffice department in making the necessary changes.

The postmaster-general intended to bring the matter to the attention of the president before the publication in advance of this part of his report. After having made preparations for publication he was suddenly called out of town without having done so.

His conclusion as to the wisdom of taking over the telegraph lines had been reached only after full investigation and consideration. As the report containing the recommendation has not yet been submitted to the president it has not yet been considered by him or by the cabinet with a view to presenting it to congress as an administration measure.

For a year or more Mr. Hitchcock has had this recommendation under consideration. After a thorough study of the operation of government controlled telegraph lines and postal telegraph systems of foreign countries he has decided to urge the matter upon congress.

"Should this recommendation be adopted," says Mr. Hitchcock, "I am convinced it would result in important economies and in materially lower telegraph rates.

"In approximately fifty countries of the world—notably in Great Britain, France, Germany, Austria, Italy, Spain, Russia and Japan—government controlled telegraphs now are in successful and profitable operation.

"In many of the countries they are operated in connection with the postal service. These telegraphs serve an aggregate population of 950,000,000, and in every instance they have been found to be of immense practical benefit to the people, in both promptitude and cost of the service."

New Jersey Commission News

As a result of complaints at Camden, N. J., against the rates of the Delaware and Atlantic Telegraph and Telephone Company, the Board of Public Utility Commissioners will make an extended investigation which will involve the fundamentals of telephone rates. As the company operates over 30,000 stations in the western and southern portions of the state it is asked that the investigation be made state-wide. Steps are on foot to secure definite systems of accounting for telephone companies, and a great deal of time has been spent in the investigation of franchises. Any franchise or privilege granted to a public utility company does not become valid until it is approved by the board. It is recommended that in the case of telephone lines, especially, the board be empowered, after proper investigation, to direct the establishment and maintenance of just and reasonable connections.

Maryland Commission News

In ratifying the sale of the capital stock of the Western Maryland Telephone Company to the Chesapeake and Potomac Telephone Company the state commission claims to have done so for the general advantage of the public, which principle, it holds, should always be the controlling consideration in such a merger. Thus while the independent company operated 2,800 stations as compared with the 800 of the Bell, the lines of the former were so surrounded by those of the latter as to make it necessary to install Bell telephones in order to secure outside connections.

Following a careful investigation of the effect of rate charges on the New England Telephone and Telegraph Company's system by Prof. Dugald C. Johnson, Boston, consulting telephone expert of the commission, the Massachusetts Highway Commission recommended that calls in excess of the minimum allowed within a radius of 8 miles of Boston be reduced from 5 cents to 3 cents and the new rates has been placed in force. The reduction will benefit about 40,000 patrons.

A public service commission has been organized in Manitoba which is vested with judicial, administrative, appellate and directory powers and shall have charge of all utilities giving public service.

DEPARTMENT of RAILWAY TELEPHONES

Railway Telephone Inspection

By John A. Kick

WHEN a considerable number of men unanimously agree on any subject the lines of reasoning must necessarily be so obvious as to leave little chance for an argument; and this is just the condition today in respect to train dispatching by telephone. There is no longer any chance for an argument as to whether the telephone is the preferable means for handling trains, but there is still room for much discussion as to its proper application; that is, the class of equipment and its maintenance.

Just as long as there are two or more kinds or types of selective signaling systems, transmission systems, and the various accessories thereto, there will be arguments pro and con as to the relative merits of the various systems and accessories, and as there will be arguments concerning the merits of the equipment, just so will there be arguments as to proper methods of maintenance; in fact there is not the least probability of a majority agreeing upon any one method of inspection and maintenance as being the one right one.

Some maintain that the inspection should be made by the station lineman in connection with his regular duties, no special schedule of timing these inspections being necessary; others that the regular man should do the inspection work at intervals not to exceed two weeks; others fixing the intervals at four weeks; and still some others claiming the method of having the regular linemen do the inspection work to be all wrong. Of those having special inspectors and maintainers very few agree as to the proper way in which these special men should handle the work. Further discussion is had as to the amount of territory which one man can satisfactorily handle, and when you consider the fact that the conditions are so widely different, there appears good reasons for the failure to agree, as that which is deemed satisfactory on an unimportant line or division cannot be accepted on an important trunk line system where every minute lost service means delays to a whole fleet of trains. However, there are several phases to the subject which I believe must be common to all; and those are, the thoroughness of the inspection, the ability of the inspector, and his outfit.

Unless an inspector looks carefully over the equipment on his territory, acquaints himself with the location and class of equipment, and generally informs himself as to the physical make-up of the plant, he will be unable to render high-class service.

As an example of the truth of the above statement, we will imagine a telephone reported out of service at any given point and the inspector instructed to get to that point and make repairs. What is the type of telephone at that point? Where is it located? Will he be able to make the repairs with the material in his regular kit? What are the surrounding conditions, and what and where is the trouble? If the inspector is perfectly familiar with all the details of the plant, he will be able to arrive at a conclusion at once, and will know that unless the trouble is out of the ordinary he can make the repairs without delay.

While at a test station recently I met the inspector for that territory, and in conversation asked him if there was a good job of soldering on the leading in wires on the office pole. He informed me that he had some time ago examined them and finding one joint which did not suit him he had resoldered it and that they were now perfect. Pretty good indication of a man being interested in covering all possible chances of trouble, and that he was going to keep just a few laps ahead of trouble.

During several general inspection trips over the lines, a careful observation of the methods of the inspectors proved very interesting. One man was found to be so busy as rarely to find time enough at any station to cover what he wished, and he was really

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical development, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

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finding and righting minor defects or possibilities of defects at every point, nothing appearing to escape his inspections. Another under practically the same conditions did absolutely nothing except enjoy a holiday spent in riding over the division on the inspection train. The first mentioned man was notified en route of a bell failing to ring at a point down the line and when approaching that station he got some dry batteries ready and in two or three minutes had the bell going. He had recently inspected the station and tested the batteries and knew that they were near the point of renewal, and correctly judged the location and remedy of the trouble.

An inspector was notified of the failure of a yard line due to one office being unable to ring any one at times, and going to this station and finding the circuit working o. k. left, notwithstanding the fact that the failures had been intermittent. The third trip to the trouble resulted in finding the circuit out of service upon his arrival, and after walking over the line and clearing a swinging cross the trouble was experienced no further. Just a case of failure to take the trouble to ask a few questions, the answers to which would have assured him he would find trouble if he looked in the right place.

Regardless of the number of the inspections there cannot be too much care taken to make them thorough and no details can with safety be overlooked.

The inspector here is a general telephone utility man who can be just as good as you like and the better he is the more you will be able to appreciate how indispensable his services are. Be he the regular station lineman or special inspector, a knowledge of the make-up of every piece of equipment and the circuit wiring is necessary to enable him to get quick and intelligent action at all times.

It is recognized that the proper way to learn the make-up of a mechanical or electrical feature of the plant is to attempt as nearly as possible to get the designers' ideas in so constructing or arranging the apparatus or circuit. While the telephone is somewhat new to some of the railway linemen yet I believe with the help of wire chiefs and others able to explain there should be no serious difficulty in qualifying a majority of the linemen to serve as capable inspectors.

There has been some little argument as to whether the inspector need be able to climb and do outside work. While there are some places where the inspector ordinarily will not be required to do outside work, yet there can be little doubt that the man who can capably do both inside and outside repair work is the preferable man for the position, as in emergency cases he is available for either duty. As these men are trusted to work alone there can be little chance for other than a reliable man to succeed in giving good service and retaining his position, as the opportunities to kill valuable time are many and very enticing to the shiftless fellow who would rather ride over the road asleep in the cabin car than get out and go over his work.

In the inspectors outfit should be, first of all, a good serviceable test set, which must be always on the job, as it is the one best means for locating troubles between stations, being as well of much assistance in locating difficult troubles within the stations. An inspector without a soldering outfit is certainly handicapped and it would seem that he could not be expected to accomplish much unless provided with a good soldering torch and iron. Induction coils are small and at least one spare coil could be carried. In fact, I believe that a small kit containing about the following would fill all needs:

Test set.
Soldering torch and iron (small).
1 induction coil.
1 receiver (the head band type without the headband).
1 push button (the type used in the transmitter circuit of the high-power transmission circuit).
3 or 4 of each kind of cords used.
1 pair long nose pliers.
1 pair side cutting pliers.
1 or 2 screw drivers.
1 small scerw starting drill.
A few assorted screws and tacks.
A bit of tape solder and wire.

Of course, there are a few odds and ends of small stuff that the inspector will find serviceable, but the total weight of his kit will not be more than half the allotted weight carried by the soldiers in our army. The inspector does his traveling by train or motor car and really does little transporting of his kit by actually carrying it, so that a fair sized kit is little or no handicap.

Atlantic Coast Line Telephones

Atlantic Coast Line work on the construction of the new telephone signal service between Charleston and Savannah is begun. This work was authorized some time ago, but was retarded by the August hurricane, which not only made it impossible to install the new service, but also destroyed the major portion of the telegraph signal service.

Work on the installation of locking devices at all railroad cross-overs and drawbridges between Charleston and Savannah will also be commenced. At the present time there are about eight stops to be made by all trains on the stretch of road, involving a considerable loss of time, especially for the fast through trains. The interlocking devices will eliminate all unnecessary stops between Charleston and Savannah and, according to railroad officials, will enable through trains to make the distance between the two cities in from thirty to forty-five minutes faster time.

The telephone signal system between Charleston and Savannah should be completed by March 1. When this work has been finished the main line of the Coast Line Road from Jacksonville to Richmond will be controlled by the telephone system. The distance between Jacksonville and Savannah will be thrown under the telephone signal system on or about January 1. The work will be done under the supervision of D. C. Marshall, supervisor of telephones, who will probably make Charleston his temporary headquarters in the near future.

The change from the telegraph to the telephone on the Coast Line is due to the satisfactory results of experiments that have been made during the past several years between Richmond and Charleston. The general superintendent of the Coast Line declares that the new system of train signalling leaves nothing to be desired on this stretch, and that he sees no reason why it should not prove equally as satisfactory and more economical when applied to the entire main line from Richmond to Jacksonville.

A Study of Telephone Transmission

Comparative Values of Line Materials*

DISCUSSION OF CALCULATED AND EXPERIMENTAL RESULTS.

TAKING up the three line constants which had to be calculated with theoretical formulas, the capacity is one which needs no further consideration, as it was calculated with a formula whose reliability has often been verified experimentally.

The line constants which are new and need investigation are the a. c. resistance and the self-induction of the copper clad wire. We shall consider first all the factors which enter into the calculation, and, second, the reliability of the formulæ themselves.

The formulæ show that the a. c. resistance and the self-induction of the copper-clad wire are functions of the dimensions, the specific resistance and the permeability, in which only the last factor was uncertain and had to be determined. We therefore need to consider the reliability of the value for the permeability of the steel core, which was adopted in the calculations.

The permeability was calculated from the measurements of the inductance of a suspended wire loop, so that, if the inductance measurements are correct, the calculated value for the permeability must also be the true value. The method and the instruments used in the measurements of the induction were therefore checked, by measuring a known inductance. For this purpose the inductance of a suspended loop of copper wire was employed, which is generally known and is also easily calculable. The measurement of the self-induction of the copper wire checked within one per cent of its known value, which shows that the experimental results are reliable. Besides that, the permeability of 62, as calculated from the inductance of an aerial iron wire loop given by Mr. Hill, comes within 10 per cent of the permeability we have found for the steel in the copper-clad wire; and finally, the measurements of the permeability of galvanized iron wire gave 71, that is 4 per cent more than that found for the steel in the copper-clad wire.

Considering the fact that the permeability of the iron is a function of previous treatment, the kind of steel and—as in our case when we deal with alternating current—the location of the steel with regard to the magnetizing field, we must say that the agreement of above figures is fairly good.

Still let us assume, that the permeability of 68 for the steel in the copper-clad wire is erroneous by 5 per cent, what effect does it have on our calculated line constants for the copper-clad wire? This is best answered by some figures, which are calculated values for the a. c. resistance and the self-induction of the copper-clad wire under the assumption that its permeability is 64.6 and 71.4 respectively, corresponding to variations of 5 per cent of the value which was used before. The effect of the permeability is larger with increasing sizes of wire, and the figures below show the effect on a No. 4 B. & S. gauge wire:

Permeability.	Calculated Self-induction.	Difference in %.	Calculated A. C. Resist.	Difference in %.
64.6	0.00362	—0.8	5.93	—0.8
68	0.00365	0.0	5.95	0.0
71.4	0.00368	+0.8	5.96	+0.2

The reason for the small effect of the permeability on the line constants of the copper-clad wire will be pointed out later, but we see here from the figures that an error of 5 per cent in the permeability produces a change of only 0.8 per cent on the self-induction and 0.3 per cent on the a. c. resistance of the copper-clad wire.

It remains now to investigate, whether the formulæ used for the calculations are correct. If, as discussed above, the calculated permeability for the steel in the copper-clad wire has been found to be a reasonable figure, this can already be regarded as indirect proof for the correctness of the formula (12) for the self-induction, because the permeability was calculated with that formula from measurements of the self-induction of a copper-clad wire. A further proof for that formula is found in the fact that if we substitute $b =$ zero and $u = 1$, which means the radius of the steel core is zero, or the whole wire is of copper, the formula reduces to the well known expression for a copper wire; or, substituting $b = a$ and $\varsigma_1 = \varsigma_2$, which means the whole wire is of iron, we obtain the familiar formula for an iron wire.

Formula (9) for calculating the a. c. resistance of a homogeneous wire is not new; it was derived by Lord Kelvin in 1889, and has been widely accepted and used. However, we have to verify its application to the copper-clad wire, as described previously. In order to do that, the a. c. resistance of a No. 9 B. & S. gauge copper-clad wire has been calculated and measured, and if formula and tests are right, the two values should be the same. The measured value of the a. c. resistance was 4 per cent larger than the measured d. c. resistance, while the calculated increase was only 0.9 per cent for a frequency of 800 p. p. s. Considering the complex nature of the calculation and the difficulty in making exact measurements of the a. c. resistance on short loops, the discrepancy of 3 per cent between calculated and observed values is not large. I hold the opinion that the calculated values are more nearly the true values than the measured values and therefore the calculated values of the a. c. resistance of the copper-clad wire were used in all the following calculations.

The results given in Table IV obtained from the measurements made on No. 9 B. & S. gauge copper-clad, No. 12 B. W. G. grade E. B. B. galvanized iron and No. 12 B. W. G. grade B. B. galvanized iron wire loops of a length about 100 feet. The figures given are calculated for a one-mile loop.

The figures show that the a. c., or effective resistance of the galvanized iron wire increases rapidly, and its self-induction decreases, with increasing frequency. Both changes are such as to increase the attenuation of the telephonic currents with increasing frequency and thereby cause distortion of the speech waves. We also see that the a. c. resistance of the No.

*A report on the comparative efficiency of copper, iron and copper-clad steel wires for telephone transmission, made to Frank R. Chambers, Jr., vice president of the Duplex Metals Company, Chester, Pa., June 20, 1911. Continued from January.

12 B. W. G. galvanized iron wire, for a frequency of 800 p. p. s., is increased 51.6 per cent and 46.8 per cent for E. B. B. and B. B., respectively, over the true or ohmic resistance.

TABLE IV.

Variations of Effective Resistance and Inductance with the Frequency.

Frequency. N.	Inductance (L) per Loop Mile. Henry.	Dec. of (L) from Its Largest Value in %.	A. C. Resist. per Loop Mile. Ohm.	Increase of A. C. Res. Over. D. C. Res. in %.
	NO. 9 B. & S. G. COPPER CLAD WIRE.			
440	0.00401	—	20.9	2.9
500	0.00398	0.7	21.0	3.3
600	0.00396	1.2	21.1	3.8
800	0.00391	2.5	21.2	4.2
1000	0.00385	4.0	21.2	4.2
1200	0.00380	5.2	21.3	4.7
1400	0.00375	6.4	21.3	4.7
D. C.	.....	...	20.3	...
	NO. 12 B. W. G. GALVANIZED IRON.		E. B. B.	
440	0.0180	—	69.2	25.4
500	0.0173	3.9	71.5	29.5
600	0.0165	8.3	75.8	37.3
800	0.0151	16	83.7	51.6
1000	0.0138	23	91.4	65.6
1200	0.0128	29	97.8	77.2
1400	0.0120	33	103.8	88.1
D. C.	.....	..	55.2	....
	NO. 12 B. W. G. GALVANIZED IRON B. B.			
440	0.0175	—	69.1	20.0
500	0.0172	1.7	72.2	25.4
600	0.0164	6.3	76.5	32.8
800	0.0150	14	84.6	46.8
1000	0.0138	21	92.0	59.7
1200	0.0128	27	99.0	71.8
1400	0.0119	32	106.2	84.4
D. C.	.....	...	57.6	....

On the other hand we find that the copper-clad wire shows only a slight change in its constants with increasing frequency. In fact the changes are so small that its behavior in this respect can be regarded as being nearly the same as that of pure copper wire, in which the changes of the constants with variations of frequency are always regarded as negligibly small.

From the figures given in the last column of Table II we see that the resistance increase of the copper-clad wire for 800 p. p. s. is less than one per cent for all sizes smaller than No. 9 B. & S. gauge and is only 9 per cent for a No. 4 B. & S. gauge wire. Against that the resistance increase for the same size (No. 4) of copper wire is found by calculation to be 2 per cent, and for a galvanized iron wire 121 per cent. Again we see that the copper-clad wire behaves more like a pure copper wire.

The table showing the self-induction due to different parts of the copper-clad wire gives in one column the part due to the presence of the iron. We see that these values are only a few per cent of the total self-induction, being largest for the large sizes of wire and smallest for the small sizes; the proportion is 15 per cent of the total self-induction in the No. 4, and 7 per cent in the No. 20 B. & S. gauge copper-clad wire.

The small influence of the steel in the copper-clad wire on the total values of the self-induction, and on the change of self-induction and a. c. resistance with frequency, when compared with copper wire, is explained by the location of the steel in the copper-clad wire. The steel, being in the center of the wire, will cause a small current density in the center, wherefore the magnetizing force in the space occupied by the steel will be small, which in turn will have only a little magnetic effect on the whole wire. In the galvanized iron wire we have iron as well in the strong as in the weak magnetic fields and we consequently obtain for the iron wire a larger self-induction, larger a. c. resistance and also a great variation of these constants with the frequency.

We conclude, therefore, that the properties of a copper-clad wire line for the transmission of speech waves are practically the same as those for pure copper wire, except that its d. c. resistance is larger than that of a pure copper line of the same size. Compared with iron wire lines the copper-clad not only has a smaller d. c. resistance, but it does not possess the disadvantageous property of varying the line constants with the frequency.

The results arrived at by calculation and experiment are so definite, and also in such close agreement, that we may proceed to the determination of the transmission efficiency of the copper-clad steel wire for telephonic speech currents.

TRANSMISSION EFFICIENCY OF COPPER-CLAD AERIAL LINES.

With the aid of previous parts of this report, we are in a position to determine the line constants of the copper-clad wire which are necessary for calculating the transmission efficiency. The line properties with which the attenuation constants have been calculated are given in Tables V to VII. The tables also contain the attenuation constant as calculated with formula (2) and the transmission equivalent as computed from formula (6). The notation employed is as follows:

R_{DC} = d. c. resistance per loop-mile as given in the catalogue of the Duplex Metals Company.

R_{AC} = a. c. resistance per loop-mile as calculated from the d. c. resistance, with the aid of R_{AC} R_{DC} as given in Table II.

L = self-induction per loop-mile taken from Table III.

C = capacity per loop-mile taken from Table III.

α = calculated attenuation constant.

T = miles of copper-clad line equivalent to 32 miles of standard cable line.

In all calculations, the results of which are given in Tables V to VII, the leakage conductance was taken as being negligibly small. The transmission efficiency calculated under this assumption is usually regarded as the normal value and is used for comparative purposes.

TABLE V.

Line Constants and Transmission Efficiency of the Normal Grade of Copper Clad Wire.

Size Wire. B. & S.	R_{DC} Ohm.	R_{AC} Ohm.	L Henry.	C M. Farad.	α	T Miles.
4.....	6.86	7.50	0.00365	0.00940	0.00590	558
5.....	8.66	9.19	0.00370	0.00918	0.00704	468
6.....	10.90	11.36	0.00374	0.00895	0.00844	390
7.....	13.80	14.19	0.00378	0.00877	0.01019	323
8.....	17.46	17.70	0.00386	0.00856	0.01214	271
9.....	21.94	22.14	0.00390	0.00838	0.01448	228
10.....	27.44	27.63	0.00394	0.00820	0.01708	193
11.....	34.50	34.67	0.00400	0.00804	0.02006	164
12.....	43.50	43.67	0.00408	0.00786	0.02337	141
13.....	55.14	55.25	0.00415	0.00772	0.02718	121
14.....	69.70	69.80	0.00420	0.00755	0.03130	105
15.....	87.84	87.90	0.00426	0.00742	0.03581	92
16.....	109.94	110.0	0.00433	0.00726	0.04052	81
17.....	141.1	141.1	0.00443	0.00715	0.04644	71
18.....	178.5	178.5	0.00449	0.00700	0.05249	62
19.....	220.5	220.5	0.00454	0.00688	0.05850	56
20.....	279.0	279.0	0.00462	0.00675	0.06584	50

TABLE VI.

Line Constants and Transmission Efficiency of the Special Grade of Copper Clad Wire.

Size Wire. B. & S.	R_{DC} Ohm.	R_{AC} Ohm.	L Henry.	C M. Farad.	α	T Miles.
4.....	5.82	6.36	0.00365	0.00940	0.00504	655
5.....	7.36	7.81	0.00370	0.00918	0.00602	547
6.....	9.28	9.67	0.00374	0.00895	0.00725	454
7.....	11.74	12.08	0.00378	0.00877	0.00880	374
8.....	14.86	15.08	0.00386	0.00856	0.01054	312
9.....	18.68	18.85	0.00390	0.00838	0.01262	260
10.....	23.36	23.52	0.00394	0.00820	0.01500	219
11.....	29.34	29.49	0.00400	0.00804	0.01772	185
12.....	37.02	37.17	0.00408	0.00786	0.02079	158
13.....	46.86	46.95	0.00415	0.00772	0.02429	135
14.....	59.32	59.43	0.00420	0.00755	0.02817	117

The a. c. resistance of copper line was taken as being the same as the d. c. resistance. The values for the d. g. resistance were taken from the catalogue of the Duplex Metals Company. The last column (T_1) gives the values of the transmission equivalent of copper wire as observed from the transmission tests.

TABLE VII.

Line Constants and Transmission Efficiency of Copper Wire.

Size Wire. B. & S.	$R_{DC} = R_{AC}$ Ohm.	L Henry.	C M. Farad.	α	T Miles.	T_1 Miles.
4	2.74	0.00322	0.00910	0.00233	1,412	...
5	3.46	0.00330	0.00918	0.00287	1,146	...
6	4.36	0.00336	0.00895	0.00253	933	970
7	5.52	0.00344	0.00877	0.00435	757	760
8	6.98	0.00352	0.00856	0.00534	616	600
9	8.78	0.00359	0.00838	0.00652	505	500
10	10.98	0.00366	0.00820	0.00790	417	430
11	13.80	0.00374	0.00804	0.00955	344	...
12	17.40	0.00381	0.00786	0.01152	285	280
13	22.02	0.00388	0.00772	0.01386	237	...
14	27.88	0.00397	0.00755	0.01647	200	...

In comparing first the columns (T) and (T_1) in Table VII, we find that the calculated and observed values of the transmission equivalents of copper wire differ from each other by a maximum of 4 per cent for No. 6 B. & S. wire. Considering that the observations may include some effect of the leakage conductance, which is larger with increasing sizes of wire, as will be shown later, but which was neglected in the calculated results given in Table V to VII, also that the resistance values of actual lines may vary slightly from the values used in the calculations, and finally that the transmission tests usually made in determining the transmission equivalent of a line are, comparatively speaking, inexact measurements, it is to be said that the calculated and observed values are in very good agreement.

The determination of the transmission equivalent of a line by means of actual tests is made by talking at one end and listening at the other end. The volume so obtained is judged by the ear and compared with the speech volume obtained through a standard cable line. The length of the cable is adjusted until the volumes over the line under test and the standard cable are alike. The transmission over the line under test is then said to be equal to the number of miles of standard cable giving the same volume. This usually requires an expert observer, who will be able to judge the relative loudness or volume of two sounds coming from two different lines and adjust them to equality, with an error of less than one mile of standard cable, when the volume of the sound is about that which is obtained over 32 miles of standard cable line. But this method of observing the transmission efficiency of a line is so relatively crude, that the observed results are only exact to about 3 per cent, and any discrepancy between transmission equivalents, which is less than 3 per cent, may be regarded as being within the limits of errors of observation. This error does not include the so-called personal error of observation; that is to say, only the same observer will be able to judge the volume of a given line within 3 per cent when testing it at different times, while if the same line is tested by some other observer, he also may judge the volume at different times within 3 per cent, but his estimates may differ from those of the first observer as much as 5 per cent. Thus in addition to the error due to the crudeness of method, there is a personal error which may make the reliability of any figures given for transmission equivalents, closer than 5 per cent, more or less problematical. The figures given in Table V and VII for copper-clad wire can certainly be regarded as being exact within the limits of the possible error of observation in actual talking tests.

In Table VIII and IX are summarized all the figures necessary in comparing copper-clad, copper and iron wire aerial lines for transmission efficiency. They contain the transmission equivalents for the different kinds and sizes of lines and also the coefficients for reducing lengths of any type of conductor to standard cable values. With these figures all questions relating to the transmission of speech waves over copper-clad wires can be answered, and next it will be shown, by a few examples, how the figures in the tables may be used.

The values for the transmission equivalents of galvanized wires were not obtained by calculation, but they are regarded as the standard figures for iron wires when the line is new, and do not include the resistance increase of iron wires with age, caused by corrosion. I have no definite figures at hand showing the resistance increase of iron wires with age and therefore cannot give the transmission equivalents of iron lines at different times after the line has been built. However, if it should be known that the resistance of the iron wire increases say 50 per cent after a certain time, its equivalent can be stated approximately as being the same as that of the size of iron wire whose, d. c. resistance, when new, is 50 per cent larger than that of the line in question.

TABLE VIII.

Transmission Equivalents and Multipliers for Galvanized Iron Lines.

Size Wire. B. W. G	E. B. B. Transmission Equivalent for 32 Miles of St. Cable. Miles.	Miles of St. Cable Equal to 1 Mile of Aerial Line (Multiplier)
6	175	0.183
8	145	0.221
10	125	0.256
12	100	0.320

TABLE IX.

Transmission Equivalents and Multipliers for Copper and Copper-Clad Aerial Lines.

Size Wire. B. & S.	Transmission Equivalent for 32 Miles of Street Cable. Normal Copper Clad. Miles.	Special Copper Clad. Miles.	Copper Wire. Miles.	Miles of St. Cable Equal to 1 Mile of Aerial Line. (Multiplier.) Normal Copper Clad.	Special Copper Clad.	Copper Wire.
4	558	655	1,412	0.057	0.049	0.0227
5	468	547	1,146	0.068	0.058	0.0279
6	390	454	933	0.082	0.070	0.0348
7	323	374	757	0.099	0.085	0.042
8	271	312	616	0.118	0.102	0.052
9	228	260	505	0.140	0.123	0.063
10	193	219	417	0.166	01.46	0.077
11	164	185	344	0.195	0.172	0.093
12	141	158	285	0.227	0.202	0.112
13	121	135	237	0.264	0.236	0.135
14	105	117	200	0.304	0.274	0.160

THE USE OF TABLES VIII AND IX.

The figures for the transmission equivalents show directly the limiting lengths of the different kinds and sizes of wires over which commercial transmission can be obtained.

Example (1). Commercial transmission is desired over an aerial line 300 miles long; what kind and size of wire can be used?

Answer: No. 7 B. & S. normal grade, or No. 8 B. & S. special grade copper-clad wire, or No. 11 copper wire. All of these wires will give somewhat better transmission than is desired. Iron wire cannot be used, as even the sizes larger than No. 6 B. W. G. would hardly give the necessary transmission, due to the rapid increase of the a. c. resistance with increasing diameter of the wire.

Example (2). Commercial transmission is de-

sired over 100 miles of aerial line; what kind and size of wire can be used?

Answer: No. 14 B. & S. copper wire being the smallest size of wire used for open aerial lines, on account of the small tensile strength of copper wires, we are obliged, if copper wire is to be used for this line, to employ No. 14 B. & S.; or we may use No. 14 B. & S. normal or special grade of copper-clad wire. We may also use No. 12 B. W. G. galvanized iron wire, grade E. B. B., but with the latter we take the risk of getting poorer transmission after a few years, than is desired to have over this line.

Example (3). An aerial line 200 miles long is to be built; what transmission can be obtained with No. 10 B. & S. wires?

Answer: No conversation could be held over such a line if built of iron wire. The normal grade of copper-clad will give a transmission of $200 \times 0.166 = 33.2$ miles of standard cable. This is still acceptably good, commercial transmission.

The special grade of copper-clad gives $200 \times 0.146 = 29.2$ miles of standard cable. The latter is somewhat better than commercial transmission.

Copper wire would give $200 \times 0.077 = 15.4$ miles of standard cable. This is very good transmission.

Example (4). Transmission characterized as equal to 20 miles of standard cable is desired over a line length of 150 miles; what kind and size of wire can be used?

Answer: The multiplier times 150 must be equal or near the value of 20. That is, $M \times 150 = 20$.

$$\text{Multiplier} = \frac{20}{150} = 0.133.$$

We see that all multipliers for iron wires are larger than 0.133, and therefore no iron wire could give the required transmission. We shall obtain somewhat better transmission than required with either No. 8 B. & S. normal, or No. 9 B. & S. special copper-clad, or No. 12 B. & S. copper wire.

After the use of the tables has been mastered by working a few examples, it should be a comparatively simple matter to figure not only the transmission but also the economy of the different line materials, if the prices and the local conditions under which the line will be built are all definitely known.

(To be Concluded.)

A Power Transmission Line's Telephones

The telephone system used to connect the various substations and municipal stations of the 110,000-volt transmission system of the Province of Ontario, is described in the *Electrical World*. The Niagara, Dundas, Toronto and London stations are what might be termed "terminal stations," since the telephone lines terminate on individual drops in the exchanges of these stations. Port Credit, Guelph, Preston, Berlin, Stratford, St. Mary's, Woodstock and St. Thomas are through stations, and the exchanges are bridged across the main line and are operated as party-line stations. These are all located on a loop circuit, which can be sectionalized by means of specially installed switches in case of trouble without interfering with the other exchanges on the loop. Telephone connection to the municipalities in the system is made through the exchange boards of the various stations supplying power to them.

The telephone lines between substations are run on separate poles paralleling the high-tension system. The telephone circuits for the low-tension line are carried on the low-tension transmission poles 5 feet below the lowest cable.

It was found that the high voltage used on the transmission system induced a potential in the telephone line sufficiently high to strain the insulation of the standard equipment beyond safe limits. Various types of protective equipment were at first employed, but were found unsatisfactory. After careful investigation and study of the conditions and requirements an entirely original protective equipment designed and standardized by the commission's engineers was installed. This equipment, is mounted on special slate panels. It consists of indicating fuses, vacuum-type lightning arresters, auxiliary gap arresters, specially wound open-core choke coils, accurately balanced bleeding inductances and condensers. Since the installation of these protective equipments the operation of the telephone system has been entirely satisfactory.

Canadian Pacific Extends Telephone Use

The Canadian Pacific Railway Company will add between 1,000 and 1,200 miles of new telephone circuits for dispatching trains. The appropriation for the work has not yet been made, but that 1,000 miles will be added to the system is a conservative estimate.

Most of the new mileage will be on the western lines, as the eastern divisions are now practically all using the telephone system. The same apparatus will be installed on the Ottawa Short Line and the remainder will be west of Fort William.

The company is operating 4,000 miles of telephone circuits, which places it second on the list of railways in the world using this system, and makes it easily the leading railway in Canada in this respect.

The advices also state that reports in eastern papers that the system was working badly on the lines in New Brunswick are incorrect. It is asserted the telephone has been distinctly successful and is in every way superior to the old system.

Theater Passes in Telephone Test

The Illinois Tunnel Company is much pleased over the success of a unique experiment it put into operation to test the efficiency of its telephone service and interest the public in the automatic device whereby it does away with the operator.

Circular letters were sent out, giving a list of twenty-five automatic telephone numbers. One of these numbers was an office from which twenty-five sets of two reserved seats each to the Illinois Theater were distributed. The first twenty-five persons calling this number got the tickets.

Officials of the company said that all Chicago got excited over the event, and that in less than an hour and a half December 20—when, during certain hours, the calls were made—50,000 calls were registered, coming from offices, factories and department stores. The total number of calls for that day, according to the officials, was 169,500.

The theater tickets were distributed according to the promise and the company was congratulated that it had taught the public anew the value of the automatic telephone.

Kellogg Portable Train Telephone

The Kellogg Company has a small salesman on the road that is proving a big order getter, especially during the recent long drawn out cold weather. This salesman is nothing more or less than the Kellogg new

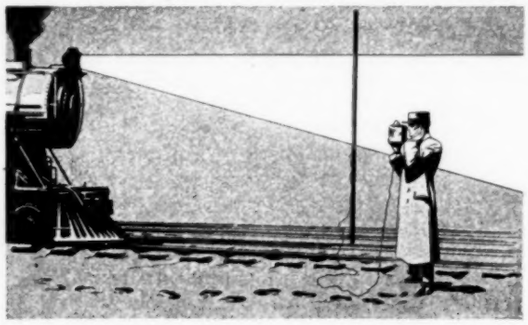

Fig. 1.

No. 2731 portable train telephone for reaching the dispatcher from any point on the line, with a connecting pole. This set is proving such a boon to the roads that have it on their trains that the Kellogg Company is having constant inquiries regarding it. One case, in particular, is interesting and has been made the subject of a folder now being sent out by the company. The illustrations, reproduced herewith, tell the story.

The road in question had been suffering from a greatly delayed schedule due to the cold, engine troubles, broken rails and frozen signals. All of these

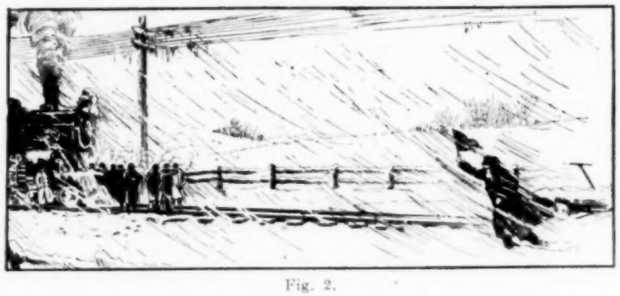

Fig. 2.

troubles meant that in spite of every precaution, trains were constantly stalled in blocks and men were obliged to go out on the right of way in a 20 below zero temperature, flag trains and help with the repair work. One morning three men came in with frozen faces. Continued cold was in prospect and the superintendent was greatly handicapped until he sent in a trial order for five Kellogg portable telephones.

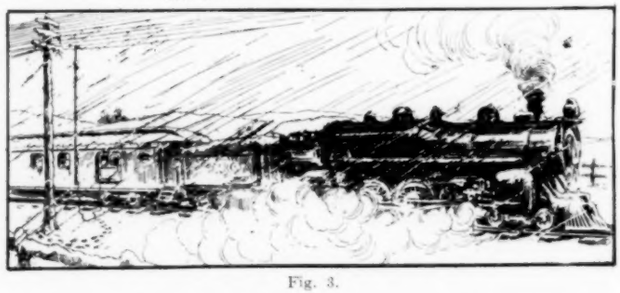

Fig. 3.

Now, when one of his trains is held up, regardless of the cause, if the crew wish to reach the dispatcher they can do so immediately, and if necessary can talk from the warmth of the baggage car. An open view of this little telephone is shown herewith and the company will answer promptly any inquiries concerning its adaptability to the needs of different roads.

For the benefit of those who have not seen this new set the dimensions are: Height, 6 13/16 inches;

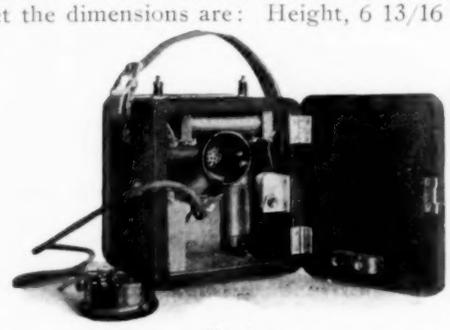

Fig. 4.

width, 6¼ inches, and depth, 6 inches. The weight is a little over 6½ pounds. The telephone proper consists of two dry cells, standard transmitter, watch case, receivers and cord, induction coil, push button and condenser. It is used by trainmen, signalmen, officials and linemen for talking to dispatcher's headquarters, and can be used with any connecting pole.

Cable Telegraph Made More Flexible

A new system of cable telegraph service was instituted by the Western Union Telegraph Company the first of the year. The appended letter from the company explains the innovation fully. It will be seen that it follows closely the day and night letter services established not long ago in the land telegraph system of the company.

January 1, 1912.

Your special attention is invited to the new "Deferred Cable Service" which this company inaugurates today, and which is subject to all the rules and regulations of our regular cable service with the following exceptions:

(1) Messages must be in plain French, or in the language of the country of origin or destination.

(2) Use of two or more languages in same message not allowed.

(3) All numbers except those used in the address must be written in words at full length.

(4) Messages are liable to be deferred in favor of those paid for at full rates for a period of not exceeding 24 hours. If delayed beyond that time they take their turn with full paid traffic.

(5) Rate charged for deferred cable is one-half the rate for regular full paid cables between the same terminals. In every deferred cable message the letters "LCF," "LCO," or "LCD" will be inserted to indicate respectively that the message is in the French language, or language of the country of origin, or in the language of the country to which the message is destined.

Until further notice this new deferred cable service will be confined to messages for Great Britain and Ireland, Germany, France, including Algeria and Tunis, Portugal, Sierre Leone, Southern Rhodesia and Trinidad, Aden in Arabia, Ascension Island, Bathurst in British Africa, British North Borneo, Ceylon, Cocos Island, Cyprus, East Africa, Uganda, Goldcoast, India and Burma, Labuan Island, New Zealand, Northern Nigeria, Perim Island, St. Helena, Somaliland, South African Union, Straits Settlement and Malay States and Zanzibar.

It is anticipated that this new deferred cable service will prove as beneficial proportionately to the public and as successful in every respect as our domestic night letter and day letter services, and it is hoped our patrons having occasion to send cablegrams will take advantage of this new service at half the regular cable rates. The rate on a regular cablegram, Chicago to any point in England, Scotland, Wales, or Ireland, is 31 cents per word, so that the rate for a deferred cable message to these points is 15½ cents per word.

Of Interest to the Trade

By A. L. Haase

An Adjustable Anchor Rod

In the Adjustarod, recently placed on the market by the Crouse-Hinds Company, a long step seems to have been taken in simplifying and facilitating the installation of "dead man" anchors. The new invention is a union of all metal parts that belong to an anchor of this character, and also has turnbuckle properties designed to permit regulation of wire tension. The Adjustarod is made in two types—"A" and "B." Type "A" consists of clamp, pulley, swivel, rod, washer and base-nut. Type "B" has an eye, to receive the guy wire; a swivel, rod, washer and base-nut. Each type, complete, is purchased as a unit and handled as such up to the actual work of installing.

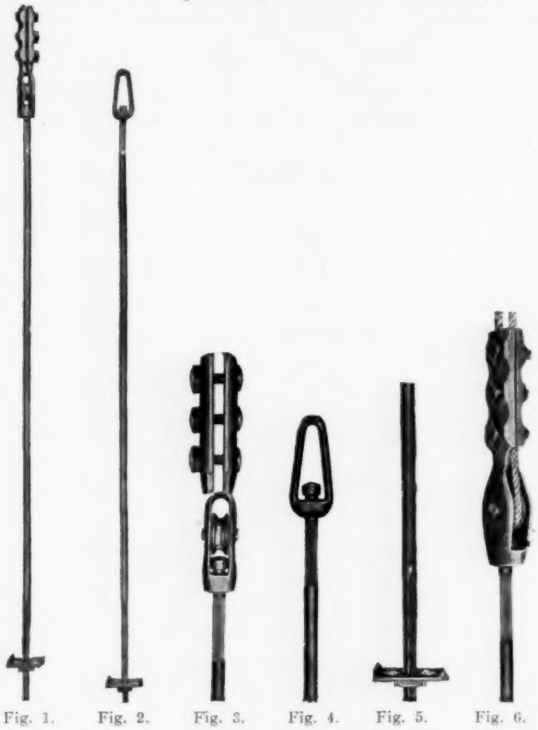

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6.

Thus buying is simplified and there is no danger of any part being found missing at the last moment.

To start at the top of type "A" and read it downward, the clamp is of malleable iron, cast in two parts, the inner surface of each being grooved to receive the guy wire. Three seven-sixteenth-inch wrought iron bolts, with heavy square heads and nuts, bind the two parts of the clamp against the guy wire, beyond the possibility of slipping. One section of the clamp is countersunk in squares on its outer surface, to fit the outline of the bolt heads. This arrangement holds the bolts immovable as the nuts are tightened. Below the clamp is the pulley, the housing of which is cast with one piece of the clamp. The sheave, or pulley wheel, is a grey iron casting, and is grooved to take guy wire up to the largest standard size. Cold rolled steel is used for the sheave pin, both ends of which are upset after mounting, thus holding the sheave permanently in position. The lower end of the pulley housing constitutes the swivel ring. Through this ring projects the upper end of the rod, topped by a substantial upset head.

The rod is of wrought iron and round, except for a few inches below the swivel ring, where square sides are provided to give a gripping surface for a wrench. On the lower end of the rod are twelve inches of threading to receive a heavy base-nut. A large washer, of No. 10 gauge sheet steel, slips on the rod immediately above the base-nut. This washer has bent-up corners that sink into the "dead man." Two down-turned ears, on opposite sides of the center hole, are stamped from the washer and provide a channel into which the base-nut fits snugly. The ears slightly overlap the nut and hold it tight against the washer. Nut and washer, together with the threaded rod, make up a turnbuckle of great strength. The rod alone is five feet long, and the over-all measurement is five feet and eleven inches.

In type "B" the combined eye and swivel ring is of malleable cast iron. All other parts are identical with those of type "A." The over-all length is five feet and four inches. While type "B" Adjustarod seemingly is assured of much popularity because of its manifest advantages over the ordinary anchor rod, the clamp and pulley device argue strongly for even greater public favor for the type "A" form of construction. When this latter type is used, the guy wire cannot bind, but runs smoothly through the pulley. The clamp, being cast with the pulley housing, is always in position to receive the wire, and hence the man's hands are free to tighten the nuts. The pulley, moreover, does away with that slipping, time consuming, temper provoking thing—a thimble. Each blow required to knock a thimble back in position carries the danger of nicking and weakening the guy wire. The elimination of this risk alone should count heavily for the type "A" Adjustarod.

Figure 1 shows Type "A" Adjustarod; Fig. 2 shows Type "B" Adjustarod; Fig. 3 shows Type "A" Adjustarod head; Fig. 4 shows Type "B" Adjustarod head; Fig. 5 shows lower end of Adjustarod; Fig. 6 shows Type "A" Adjustarod head with wire clamped in.

The Automatic Monitoring System

During the past few years many of the large operating companies have written to the Automatic Electric Company asking if it had some device for monitoring all operators from one point. For several of these the company designed apparatus to fill this need and in several exchanges where it has been installed it has given very satisfactory service and proved itself invaluable to the manager.

With this system it is only necessary for the manager to turn the dial of his telephone to call into the circuit of any operator in his exchanges. If a man has ten exchanges in the city, it is only necessary for

him to turn the number on the dial which has been assigned to the exchange to get into communication with that exchange, and then to turn the number which has been assigned to the operator to get into that operator's circuit. The connections are made absolutely noiselessly and secretly so that there is no chance of the operator being warned of supervision. If he desires the manager can talk to the operator by merely pressing a small button which is supplied with each set.

With this system the manager can personally supervise every operator in his service from his own desk at his office or from his own home—or from any other place he desires. With the calling system in his own home he can monitor the service on Sundays, holidays and evenings at times when the service is usually worst. He can monitor from his office during the day and thus do away with the necessity of visiting the various exchanges and monitoring them from the chief operator's desk. Monitoring from the chief operator's desk is unsatisfactory because it necessitates his presence in the room in most cases. His entrance puts every operator on her guard and consequently for the moment improves the service.

The cost of this system is nominal and consists of very simple parts which are easily installed and which once installed need no further attention. All the parts are adjusted before leaving the factory and require no further attention after once being installed. The system was perfected by the Automatic Electric Company to fill a very evident need of the manual operating companies. Such a system once installed will do much to improve manual service and to decrease the cost of operating. It has passed the experimental stage as is shown by the satisfaction expressed by those companies which have already put it into service.

Book Reviews

THE THEORY OF ELECTROMAGNETISM, by G. T. Walker, is a short but very advanced mathematical textbook on the vectorial theory of electromagnetism. The book contains seven chapters, which deal respectively with: Vector analysis; applications of vectorial methods to magnetostatics; the theory of Maxwell as expressed by Hertz; Hertz's equations for moving media; effects due to the motion of charged particles through a stationary ether; the election theory of Lorenz applied to moving media, and the same theory applied to stationary media.

It is the intention of the book to prove that Maxwell's equations as developed by Hertz are not in conformity with experimental facts in certain particulars, while the theory of Lorenz does agree with the facts. Some of the conditions of relativity are deduced in the manner originally demonstrated by Lorenz.

Published by Cambridge University Press; 52 pages, price 3s.

TELEPHONY, by H. R. Van Deventer. This is the third edition of this new but popular work. The first edition was reviewed at some length in TELEPHONE ENGINEER for March, 1910. The pages have been increased to 637 and a comprehensive index. The book, of course, retains its original value as an exhaustive treatise, from first principles to applied engineering, and perhaps its most valuable feature is its intensely practical nature.

The third edition is revised throughout, and much new matter is added. Major George O. Squier has an article on Multiplex Telephony and Telegraphy; E. E. Clement discusses the Automanual System, and W. E. Harkness the Railway Telephone Selector, while recent developments in manufacturing are treated at first hand. The work is thus brought practically up to the minute, and forms a complete encyclopedia of telephonic information for the practical worker or the student. The book should be especially valuable for those subordinate employees who are ambitious to rise in the field.

Cost of Operating Motor Trucks

A considerable number of truck manufacturers who have been in business for ten years or more have had so many of their machines in service in different trades and widely separated localities that they have been able to collect a great volume of cost records and from these to calculate averages and tabulate them in an easily available form. Several such makers will have trade literature containing this information for distribution to interested visitors at their exhibits during the second week of the Chicago Automobile Show, from February 5 to 10.

One such company, a pioneer in the commercial vehicle field, has compiled a table of average costs of operation of its principal sizes of gasoline trucks covering a period of seven years of active service. This table shows that the daily cost of a two-ton truck that averages seventy miles a day is $10.60; that of a three-ton machine averaging sixty-two miles a day, $12.20; of a four-ton truck averaging fifty-five miles a day, $13.80, and of a five-ton truck averaging fifty miles a day, $15.

Another long established company has compiled a similar cost table covering a period of more than six years. This shows the average daily cost of running a one-ton wagon to be $8.07, of a two-ton truck $10.25, a three-ton truck $11.30, five-ton truck $14.80, seven-ton truck $16.45 and of a ten-ton truck $18.50 a day.

Figures for 1,500-pound wagons are furnished by a well-known pioneer in light car manufacture. They apply to nearly 1,000 of these wagons in various parts of the country and in many lines of trade. The results of the tabulation show the average daily cost of running such a wagon capable of averaging seventy miles daily in regular service to be $86.10 a month, or $3.20 a day. This table does not include any charge for storage or garage work nor any insurance premium as do other tables.

The figures given for the trucks of one to ten tons capacity include all items properly chargeable to the hauling service, both actual running expenses and overhead. Driver's wages are figured at $16 to $22 per week, gasoline at 12 cents a gallon, oil at 30 cents, garage at $225 to $300 a year, tires at $275 for a one-ton machine to $1,650 for a ten-ton truck, overhauling and general repairing at $300 to $550, depreciation at 15 per cent, interest at 5 per cent, and fire and liability insurance at $150 to $240 per annum.

One of the half dozen exhibitors of electric commercial vehicles at the Chicago Coliseum furnishes a table of general average operating costs for the three models which it makes. Fixed charges on the de-

livery wagon amount to $303 a year for interest and depreciation on non-wearing parts; maintenance for maximum service to $389.50 a year, and garaging, including charging current, to $108. This amounts to $800.50 a year, or $2.66 per working day, not including drivers' wages. At $15 a week, wages would bring the total daily cost to $5.16. On the same basis the total cost of running the light truck is $5.63 a day and that of running the heavy truck $6.91 a day. Larger and heavier makes of electric trucks cost from $7 to $8 a day to operate.

According to the testimony of large business houses it costs from $6 to $6.50 a day to keep a wagon and team of horses at work, but the motor truck does the work of three such outfits, and effects a saving in operation of 33⅓ per cent. Figured in cost per ton mile, the gasoline motor vehicle shows an efficiency of 175 to 200 per cent as compared with horses.

Western Electric Company Sales

Western Electric's year, ended December last, shows a total of $67,000,000 in goods billed out, or about six per cent greater than the corresponding twelve months in 1910, and ranks as the second largest the company has experienced.

The company has now nearly recovered all the ground that it lost after 1906, with this difference, that the 1906 great total was due to an unusual expansion of the telephone industry while last year's business was the result of a normal demand. Further, the business last year was transacted in smaller units than in 1906 and hence with a considerably larger number of customers.

Increased cost of labor and material, while the prices of manufactured articles have not advanced, have cut down the Western Electric's margins of profits in common with many industrials. The situation has been largely met by introducing operating economies and scientific management of manufacturing operations. At the close of the year there were about 24,000 persons on the pay-rolls of which about 12,000 were at the Chicago plants, the others being distributed in the factories in New York, through the 30 houses in the United States, and the factories abroad.

Western Electric's business in Chicago and the Middle West suffered less last year than in the East, where most of depression talk has come from. A business for this year as large as last is expected with some lines showing increases. At Hawthorne new buildings have been erected which will be occupied by the end of this year and the work of concentrating the manufacturing at that point will be continued.

Commissions to Have Official Organ

The National Association of Railway Commissioners—the country-wide organization of state railroad, public service, utility and interstate commerce commissioners—is to have an official organ which will carry monthly a resume of rulings, regulations and decisions of the state and federal transportations regulatory bodies. These data, which will be furnished direct by the various commissions, will cover not only the activities of the governmental supervisory bodies with respect to traffic, rates and services, but will also include the official accounts of orders along other lines, such as safety appliances rules and general operating regulations. Such a publication has been advocated for several years by the commissioners and the records of the past annual conventions of their association show tentative indorsements of such a work. At the 1911 meeting, however, the matter was finally brought to a head, the issue definitely decided upon and the work of preparation and publication intrusted to the Traffic Service Bureau of Washington and Chicago. The commissioners' journal is known as *Public Service Regulation*.

Monarch Company Goes to Iowa

Fort Dodge, Iowa, has had an addition to its industries in the Monarch Telephone Manufacturing Company, which is moving there from Chicago. The company is capitalized at $150,000, employs 150 skilled workmen, and is one of ten important factories of its kind in the country.

The new name of the company will be the Monarch Telephone Company of Iowa. It will occupy a four-story building recently vacated by the Leighton Supply Company.

O. M. Oleson of Fort Dodge is president of the concern, J. C. Hubacher of Chicago is vice-president W. H. Trim of Chicago is secretary, and T. H. Wright of Fort Dodge is treasurer.

The Monarch Telephone Manufacturing Company of Chicago recently was divided, one part of the plant manufacturing time recording clocks and allied devices remaining in Chicago in charge of Ernest E. Yaxley and the other, the telephone manufacturing part, moving to Iowa.

Paragon Ground Cone Recommended

The Block Signal and Train Control Board has reported to the Interstate Commerce Commission commending the Paragon ground cone, which was submitted to the board by the Paragon Sellers Company, Chicago. This action at once provides the railroads of the country with official sanction of the use of the Paragon ground device.

Lorimer-Lundquist Patents Sold

A lawsuit has revealed the fact that all the patents of the Lorimer-Lundquist Company, Chicago, relating to automatic telephony, have been purchased by the Western Electric Company for $650,000. The transaction gives renewed importance to these patents.

The National Conduit and Cable Company, New York, makes the following announcement:

We have added to our various departments a large brass foundry under special laboratory supervision, for making high class castings of all description. Let us have your requirements, sending us either the alloys you use, your drawings or samples, and the requirements you have to meet, and we will be pleased to quote you our prices. The high grade goods turned out in our other departments should be a guarantee of what to expect from this.

China's population is over four hundred million. But New York City has about a hundred times as many telephones as China, simply because everyone in New York uses the telephone. We haven't got the circulation of some of the popular magazines, but every one of our readers buys telephone supplies. Have you any to sell?

Novel Features of Corwin Apparatus

The Corwin Telephone Manufacturing Company, 904 West Lake street, Chicago, which has for some years been devoting itself to the development and manufacture of that class of telephone apparatus known as P. B. X. and self-operating or "intercom" telephones, for use in stores, factories, hotels, schools, hospitals, offices, apartment, office and municipal buildings and steamships, announces the issue of a new catalogue which it claims is the most complete and comprehensive published. This catalogue, illustrating and describing the company's full line of apparatus, is divided into sections, each of which is devoted to one particular class of instruments or circuits and is compiled in a most thorough and understandable manner. It also contains a section devoted exclusively to construction and installation, apparatus details, wiring suggestions, etc., and will undoubtedly prove of interest to every telephone man.

Circuits showing wiring and schematic diagrams are dealt with in a liberal and intelligent manner and should prove a ready reference to the installer and maintainer of this class of telephone systems.

The company claims many innovations in its apparatus, among which may be mentioned:

Desk stand of standard size with bell or bell and push button in base.

Wall telephones in the well known hotel and flush types.

Removable switch-hook and spring group of novel construction.

Universal bracket for mounting self-operating keys on either a flat or roll top desk without disfiguring or marring it.

An adjustable mouthpiece which does away with breakage due to the strain put on it in changing position of transmitter or transmitter arm.

Adjustaphone and flexiphone outfits.

Hand microphone outfits.

A direct current receiver of unusual merit in both regular and pony sizes.

A junction box for either wall or floor use by the aid of which it is possible to connect up one or more cables in less than half the time usually employed, and open up a pair or pairs of a cable for test in less time than it takes to tell about it.

The apparatus is adaptable to a variety of systems covering almost any conceivable condition, all of which is fully described in the company's respective catalogues covering—"Municipal Talking and Common Signaling System"; "Municipal Talking and Selective Signaling System"; "Selective Talking and Selective Signaling System"; "Non-Secret-Individual Talking and Individual Signaling," with or without connection to automatic, common battery or magneto exchange, and "Secret-Individual Talking and Individual Signaling," with or without connection to automatic, common battery or magneto exchange.

The company calls special attention to its "secret systems" (broadly covered by patents), in which an established connection cannot be interrupted or interfered with at the attendant's or any other station in the system. It has furnished the secret apparatus installed in connection with the automatic telephone system in Chicago, but has made changes in apparatus and circuits which have improved and simplified and reduced the cost of secret systems. The apparatus and circuits are extremely flexible and where it is desired to install non-secret service with a possibility of changing to secret service at a later date, such change may be made by a slight change in the selecting apparatus at each station and without changing the original wiring installation, thus involving very little labor.

The operating man will be interested in the claim of low first cost, maintenance and low current consumption.

The company's self-operating keys are of a new and novel construction, making for stability and accessibility, which is also true of its telephones.

To all these advantages is added the well known Corwin finish and guarantee of quality and service and further still is added the guarantee of Frank B. Cook, who will in future manufacture all Corwin apparatus, the Corwin Company devoting itself to the design and sale of these goods.

Frank B. Cook, whom we mentioned in our issue of November, 1911, is too well known as a capable telephone engineer and manufacturer to need further mention. The fact that he manufactures Corwin apparatus insures its quality.

Automanual in Patent Agreement

An announcement on our back cover this month states that the North Electric Company has granted to the Western Electric Company a non-exclusive license to manufacture and sell Automanual apparatus equipped with the Telechronometer, and in exchange the Western Electric Company has licensed the North Company under the patents it controls on the subject. The exchange of patent courtesies carries with it absolutely no business affiliation, however.

This is a fitting testimonial to the importance of the devices controlled by North. An article describing the Automanual system and Telechronometer in practice will appear in our next number.

An Invitation to the N. E. L. A.

The National Electric Lamp Association will hold its annual convention in Seattle next June. In view of the fact that many of the delegates will pass through Montana, the Northern Idaho and Montana Power Company has addressed to the association the following invitation:

Kalispell, Montana.

N. E. L. A. Delegates: On your return from the N. E. L. A. convention at Seattle, in June, we would be pleased to have you stop over and explore our beautiful country, "the Switzerland of America."

Trout fishing in every stream, and the most delightful climate in the world. Therefore, we extend to you a hearty invitation, and you will find the N. E. L. A. glad hand to receive you.

NORTHERN IDAHO & MONTANA POWER CO.,
W. B. MacDonald, Genl. mgr.
A. P. Tills, New Business mgr.

The Diamond Ground Clamp

The new Diamond Ground Clamp, just put on the market by the Diamond Expansion Bolt Company, New York, consists of a strap of flexible metal intended to clamp around the ground pipe, two interlocking or telescoping pieces of metal which engage the ends of the strap, and a bolt which draws the metal pieces together and pulls the strap tight. It is

very simple to attach. The two telescoping parts are separated as far as possible, the band or strap passed around the pipe and its end drawn tight. Then the bolt is tightened with a screw-driver. Thus the device may be used with any size pipe, and may be clamped so tightly that slip is impossible. A hexagon brass nut and washer are used on the end of the screw for fastening the ground wire.

A report from an American consular officer calls attention to the opportunity which is likely to be found in his district for the sale of a municipal telephone plant, due to the increase in rates by the present telephone system in operation. The matter of a new system has already been considered, and it is likely to be brought up for further discussion and action shortly. The report states that in the meantime it might be well for American manufacturers of telephone instruments and systems to communicate with the mayor of the city in question. Further details of the report can be obtained from the Bureau of Manufacturers, File No. 7862.

Arrangements have been completed for the reconstruction of the Guanajuato State telephone line, and a concession will soon be granted for the installation of new telephones for public use. At present the line is used exclusively by the government for official business, but it has been found that facilities granted to the public will have the effect of developing trade and industry through the establishment of a rapid means of communication.

W. N. Matthews & Brother have removed from 227 North Second street to Forest Park boulevard, St. Louis, Mo.

Brevities of the Business

PERSONAL NOTES.

J. H. Lyons, for the past four years district manager of the Michigan State Telephone Company at Battle Creek, has been promoted to the commercial department of the company at Detroit, where he will have a much more responsible position. Mr. Lyons was recently made a charter member of the American Telephone and Telegraph Company's association, a social organization formed in New York City a short time ago.

F. N. Clifford has been appointed manager of the Southwestern Telephone and Telegraph Company's exchange at Lockhart, Texas.

Fred G. Greber, assistant chief engineer of the Southwestern Telegraph and Telephone Company, Dallas, Texas, has been appointed general manager of the West Texas Telephone Company, with headquarters at Brownwood.

Roy J. Heller has been promoted to the position of district plant inspector for the Bell Telephone Company, with headquarters at Toledo.

E. A. Sanders, district manager for the American Telegraph and Telephone Company at Alliance, Ohio, has been transferred to Youngstown, succeeding J. B. McGahn, who has been transferred to Cleveland.

C. P. Morrill has been appointed commercial engineer of the Pacific Telephone and Telegraph Company at San Francisco, Cal., to succeed Elam Miller, who has resigned to accept a position with the American Telephone and Telegraph Company in New York.

F. A. Pierce, wire chief at the Salamanca exchange of the Federal Telephone and Telegraph Company, has been appointed manager of the company's business at Franklinville, N. Y.

Macon Martin has been appointed district manager of the Southern Bell Telephone Company at Atlanta, Ga.

C. F. Smith, formerly manager for the Citizens' Telephone Company at Cadillac, has been appointed to take charge of the long distance work of the company, with headquarters at Grand Rapids.

Rollo R. Stevens has been appointed commercial superintendent of the Ohio division of the Bell Telephone lines. He will have as his assistant J. T. Daniels, local manager at Columbus, who has been succeeded by J. T. Druckmiller of Dayton.

J. M. Henshaw, Waco, Texas, after fourteen years of service with the Southwestern Telephone and Telegraph Company, has resigned his position with that company to accept the position of traffic manager for the Brazos Valley Telephone and Telegraph Company, which gives him more responsibility and a much larger field in which to operate.

N. B. Lackland, of Granbury, has been appointed manager of the Southwestern Telephone Company at Marlin, Texas, succeeding J. P. Williford, who has been placed in charge of the company's exchange at Sherman, Texas.

P. Kerr Higgins, assistant to the president of the Pioneer Telephone and Telegraph Company, Oklahoma City, Okla., and E. E. Bawsel, connected with the Southern Bell Telephone and Telegraph Company, Atlanta, Ga., have been appointed corresponding secretaries of the Telephone Pioneers of America.

Theodore Thorward, well known in independent telephone circles throughout Indiana and Michigan, was recently tendered a banquet at the Oliver hotel, South Bend, by the independent telephone men of northern Indiana, at which time he was the recipient of a gold watch and chain. The presentation speech was made by Congressman H. A. Barnhart of Rochester, Indiana, also well known in the telephone field.

J. V. Young, manager of the Wisconsin Telephone Company at La Crosse, has been promoted to the position of district traffic chief of the Madison district, which includes Madison, Janesville, Beloit, Watertown, Baraboo, Prairie du Chien, Portage, Beaver Dam, Waupun and all intervening towns. He will be succeeded at La Crosse by J. A. McManman of Columbus, Ohio, who was formerly in the employ of the company.

J. J. Morrison, district manager for the Michigan State Telephone Company at Port Huron, has been transferred to the same position with the Grand Rapids division. He will be succeeded at Port Huron by Frank O'Brien, who has been transferred from Traverse City.

Minor M. Davis was recently appointed superintendent of telephones of the Postal Telegraph-Cable Company. Mr. Davis announces that his company has issued instructions to its construction department to proceed with the erection of additional heavy copper wires between all important points on the system for the purpose of extending the telephonic use of same to the independent telephone companies.

Harry J. Kerr has taken charge of the Okanogan Telephone and Telegraph Company, Okanogan, Wash., succeeding J. F. Stickles, resigned.

F. Patterson, Jr., has been appointed commercial manager of the Corpus Christi district of the Southwestern Telephone and Telegraph Company.

W. F. McMahon, for the past six years manager of the New York Telephone Company's exchange at Cortland, has assumed the management of the Ithaca and Cortland exchanges, succeeding William J. Mitchell, who has been transferred to the management of the Utica office.

William Geopfarth, wire chief in the local exchange of the Mountain States Telephone and Telegraph Company at Nampa, Idaho, has been promoted to the managership of the company's exchange at Emmett.

C. D. Thornton, formerly of Jacksonville, Fla., has been appointed plant chief for the Southwestern Telephone and Telegraph Company, with headquarters at Helena, Ark., to succeed W. C. Gardner, who has been transferred to a similar position with the company at Fayetteville.

Charles E. Wilde, district commercial manager of the Michigan State Telephone Company, with headquarters at Grand Rapids, has been promoted to state commercial superintendent with headquarters at Detroit. Mr. Wilde has been with the company for twenty-seven years, starting at the switchboard at Petoskey. He will be succeeded at Grand Rapids by George R. Heywood, for the past two years in charge of the contract department in that city. He was given a farewell banquet by the district managers of the company and was presented with a library table.

Charles B. Connolly, advertising manager of the Missouri and Kansas Telephone Company, died at his home in Kansas City on January 10th, following an operation for appendicitis.

J. D. Givens, wire chief for the Home Telephone Company at Excelsior Springs, Mo., has been transferred to Kansas City.

A. J. Elby has been appointed manager of the Holt Telephone Company, Liberty, Mo., succeeding Dr. Gleaves, resigned.

Eugene L. Brown, well known in the independent telephone field, having been connected with some of the most important manufacturing companies, has been appointed sales engineer for the American Electric Company, of Chicago.

Chas. E. Bryan, division superintendent of the Chesapeake and Potomac Telephone Company, has been promoted to the position of commercial agent for the general division of the company, with headquarters at Baltimore. This division includes Maryland, District of Columbia, Virginia and West Virginia.

Walter Teat, who has been in the service of the Missouri and Kansas Telephone Company at Cottonwood Falls, Kan., for the past eight years, has been appointed manager over all the company's lines.

F. H. Bethel, vice-president of the Bell Telephone Company of Pennsylvania and associated companies, has been elected president of the Bell Telephone Company of Pennsylvania, the Delaware and Atlantic Telegraph and Telephone Company, the Diamond State Telephone Company and the Chesapeake and Potomac Telephone Company, to succeed Union N. Bethel, who becomes chairman of the board of directors of the above named companies.

F. X. Cleary, who recently resigned his position as advertising manager for the Western Electric Company, in which capacity he had served the company for the past three years, has connected himself with the Cheltenham Advertising Service of New York City.

John Fletcher, formerly superintendent of the British Columbia lines, has been appointed telegraphic superintendent of traffic, a new position created by the Canadian Pacific Railway.

Samuel D. Gloss, formerly with the Simplex Electrical Company, has been appointed sales manager of the Atlantic Insulated Wire and Cable Company, 120 Liberty street, New York.

Frank Colvert, of Gulfport, Miss., has been appointed district manager of the Cumberland Telephone Company, succeeding George D. Stockman.

Angus S. Hibbard, formerly general manager and vice-president of the Chicago Telephone Company, but now with the American Telephone and Telegraph Company of New York City, spent holiday week with his many friends in Chicago and on December 28th acted in his old capacity as song-master at the banquet of the Chicago Association of Commerce, for which occasion he composed a number of new songs.

Richard Sherwood Satterlee, who has been connected with the Habirshaw Wire Company, Yonkers, N. Y., for the past ten years and for several years past has filled the position of second vice-president, also a member of the board of trustees, was recently elected president of the company. Mr. Satterlee is wide and favorably known in the electrical field.

On January 3rd, J. L. W. Zeitlow, president of the Dakota Central Telephone Company, Aberdeen, S. D., tendered a banquet in that city to his associates in the company and the pioneer residents of the state, the occasion being the twenty-fifth anniversary of the installation of the company's first telephone. Among those in attendance was H. V. Hemenway, district manager for the company at Oakes, N. D., who strung the first wire in Aberdeen in 1886, which was done for the purpose of actually demonstrating to the public that "the thing would talk." It did and has been talking ever since. The statement is made that insulated wire was used in the beginning, but before the line was completed Mr. Hemehway was compelled to finish with stove wire and that the Aberdeen exchange was founded on the strength of stove wire. History proves that not only was the foundation laid deep and strong, but the superstructure shows the hand of a master-builder as the company now has a capital stock of $1,000,000 and extends its excellent service throughout the Dakotas and into Minnesota.

Albert Scheible, research engineer and solicitor of patents, has moved his offices to room 1519 Marquette building, Dearborn and Adams streets, Chicago.

F. Douglas Watson, late provincial superintendent for the National Telephone Company in Scotland, has been appointed general manager and secretary for the Constantinople Telephone Company, Constantinople, Turkey, and will at once take up his duties in that city.

NEW TELEPHONE COMPANIES.

CENTRE, ALA.—One of the objects of the Cherokee County Co-operative Company, which has been incorporated with a capital stock of $30,000 is the establishment of telephone lines. The incorporators and officers are as follows: President and general manager, F. H. Carter; vice-president, Dr. C. S. Totum.

REEDLEY, CAL.—T. M. Lane, Carson Reed, Lucas Keyser and E. K. Smith are interested in the formation of a telephone company to take over the local telephone system.

QUITMAN, GA.—The Marven Telephone Company has been incorporated with the following officers: President, B. F. Scruggs; vice-president, A. J. Hodges; secretary and treasurer, E. Lloyd Knight.

LAPWAI, IDAHO—Articles of incorporation have been filed for the Tom Beall Telephone Company with a capital stock of $10,000. The incorporators are W. W. Olds, Dan Moore, J. W. Fenderson, J. J. Hogaboam, G. N. Elliott, D. G. Hogaboam and Ira F. King.

HENRY, ILL.—The Henery Telephone Company has been incorporated by E. S. Sterrett, C. A. Camp and Fred W. Potter, with a capital stock of $2,500.

ASHMORE, ILL.—Articles of incorporation have been filed for the Ashmore Mutual Telephone Company by J. C. Reed, W. R. Comstock, J. E. Dudley and R. A. Larrabee; capital stock, $2,500.

PESOTUM, ILL.—The Pesotum Telephone Company has been incorporated with a capital stock of $2,200 by Henry Pfeffer, E. V. Burton and Charles Eichhorst.

ROCKFORD, ILL.—The Northwestern Telephone and Telegraph Company has been incorporated with a capital stock of $1,500 by George P. Gallaher, George J. King and John M. Camlin.

BUCKLEY, ILL.—The Buckley Telephone Company has been incorporated with a capital stock of $20,000 to do a general telephone and telegraph business. The incorporators are William S. Hale, Harry S. Boesart, Elwin Hull, Frank E. Singleton, and William Krumwiedie.

SAVANNA, ILL.—The Savanna Mutual Telephone Company has been incorporated with a capital stock of $15,500 by L. H. Maloney, J. D. Lynness and C. C. Thill.

NOBLESVILLE, IND.—The Deming Telephone Company has been incorporated with a capital stock of $10,000 for the purpose of constructing and maintaining a telephone system throughout Hamilton county. The incorporators are J. B. Sturdevant, M. Jessup and B. Jessup.

MARION, IND.—The Marion Telephone Company has been incorporated with a capital stock of $100,000 by David Blumenthal and Jerome Herff.

MORAN, IND.—The People's Telephone Company has been incorporated with a capital stock of $3,000 by H. G. Hurless and others.

ALBIN, IA.—The Sand Cove and New Albin Telephone Company has been incorporated by Pat Moore, Alvis Hammel and George Meyer.

MUSCATINE, IA.—The Lucas Grove Telephone Company has been incorporated with a capital stock of $2,000.

STANTON, IA.—The Farmers' Mutual Telephone Company has been incorporated with a capital stock of $10,000 by H. M. Dirrim, J. O. Clauder and J. X. Larson.

NEWHALL, IA.—The Newhall Farmers' Telephone Company has been incorporated with a capital stock of $8,000 by P. N. Kahler, J. P. Fix and J. P. Olson.

DODGE CITY, KAN.—The Dodge City and Colmer Telephone Company has been incorporated with a capital stock of $500.

HALSTEAD, KAN.—The South Lakin Telephone Company has been granted a new charter; capital stock $10,000.

ARMA, KAN.—Articles of incorporation have been filed for the Arma Central Telephone Company with a capital stock of $2,000. The incorporators are J. R. Palmer, L. F. Keck, Sam Bilelle, S. R. Wiley and C. M. Gibson.

OWENSBORO, KY.—Articles of incorporation have been filed for the Hartford Telephone Company with a capital stock of $10,000. The incorporators are William W. Crawford, W. T. Hale and J. Joseph Hettinger, all of Louisville.

BRAVO, R. F. D., MICH.—The Allegan Farmers' Telephone Company has been incorporated with a capital stock of $5,000 by J. H. Hamlin and F. G. Barbee, Bravo, and H. Keller, Allegan.

JELLE, MINN.—Articles of incorporation have been filed for the Eastern Development Telephone Company with a capital stock of $4,980. The incorporators are John W. Anderson and James O. Hill of Thorbult and Leon L. O'Dell of Jelle.

HENNING, MINN.—The Henning-Start Telephone Company has been incorporated by Charles Johnson, M. Peterson, Ole Olson, Anton Hanson and others with a capital of $3,500.

Maysville, Mo.—The De Kalb County Telephone Company has been incorporated with a capital stock of $25,000, and the officers are as follows: President, J. H. Snow, Stewartsville; vice-president, E. A. Hofstater, Maysville; treasurer, Dr. J. A. Mitchell, Maysville; secretary and general manager, L. H. Roberts, Stewartsville; directors, the above officers and Judge J. B. Harper, King City; A. L. Bonahan, Osborn; J. P. Carmichael, Fairport; S. G. Thompson, King City; Frank Selix, Maysville. The new company purchased the Mutual telephone plant in this city early in December, paying $16,500 for same and it is the intention to thoroughly remodel the plant. Practically all of the county lines will be rebuilt. L. H. Roberts, the new secretary and general manager, is one of the most widely known telephone officials in that section of the state, having been general manager of the Clinton County Telephone Company of Plattsburg for the past six years.

Eureka, Mont.—The Eureka Mutual Telephone Company of Lincoln county has been incorporated with a capital stock of $20,000. The directors of the company are as follows: F. P. Corey, P. N. Bernard, A. M. Mikalson, F. B. Bogardus and J. W. McCalder.

Haigler, Neb.—The Caldwell-Haigler Telephone Company has been incorporated with a capital stock of $1,000.

Centerville, N. Y.—The Centerville Telephone Company has been incorporated with a capital stock of $2,000. The directors of the company are John C. Gibby, E. Burr, Victor O. Crowell, Wilbur C. Powell, R. W. Buttler, Chas. B. Pomeroy and Nelson L. Hauber.

Ether, N. C.—The Ether Rural Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are W. L. Freeman, T. H. Woods and others.

Kinston, N. C.—The Pink Hill Telephone Company has been incorporated with a capital stock of $20,000 by George Turner of Pink Hill and William Hayes, Henry Tull and R. M. Bryant of Kinston.

Broken Bow, Okla.—The Broken Bow Telephone Company has been incorporated with a capital stock of $1,200. The incorporators are E. J. Roberts, Jud Moore, Vallaint, and S. B. Callahan, Idabel.

Lookeba, Okla.—The Lookeba and Binger Telephone Company has been incorporated with a capital stock of $500 by J. S. Sensintaffar, J. D. Inman, L. W. Vance, B. D. Brown and J. J. Chambers, all of Lookeba.

West Newton, Pa.—The Sewickley Telephone Company has been organized with the following officers: President, Oliver Lash; vice-president, Roy Andrews; secretary, Simon Sherbondy; treasurer, Harry Milligan.

McBee, S. C.—The Highlands Telephone and Telegraph Company has been incorporated with a capital stock of $5,000 by W. M. Phiper, L. A. Kerr and C. J. Williams. The company will do a general telephone and telegraph business.

Pages Mills, S. C.—The Pages Mills Telephone Company has been incorporated with a capital stock of $1,400 by H. H. Bailey, James P. Watson, W. M. Gaddy and M. C. Lester.

Huron, S. D.—Articles of incorporation have been filed for the Great Western Telephone Company with a capital stock of $80,000. The incorporators are E. M. Taylor, M. L. Taylor, W. J. Taylor, Crookston, Minn.; P. M. Lorenz, Dubuque, Ia.; A. C. Foldesi, Huron.

Dyersburg, Tenn.—The Dyersburg Home Telephone Company has been incorporated with a capital stock of $5,000. The company will install an exchange and construct 100 miles of toll lines in the near future.

Rutherford, Tenn.—The Rutherford Home Telephone Company has been incorporated with a capital stock of $2,000 by R. M. Halford, M. Peel, W. R. Canada and J. L. Brown.

Quanah, Tex.—J. L. Tullis, W. T. Perkins, F. B. Kirby and others have organized an independent telephone company for the purpose of installing a telephone system in this place. F. B. Kirby is general manager. A common battery system will be installed and all wires in the city limits will be placed under ground.

Provo, Utah—The Palmyra Telephone and Electric Light Company, consisting of twenty-three business men of Spanish Fork and Sanpete, has filed articles of incorporation with the county clerk. The object of the new company is to obtain electric current from the government plant at the mouth of Spanish Fork canyon and distribute it to the various small towns in the south end of the county. It is the intention to build up a strong company in that section.

Holland, Va.—A telephone company has been organized in this place with the following officers: President, I. A. Luke; vice-president, W. Quinton Keele; secretary, Lester J. Daughtrey; treasurer, W. V. Leathers; directors, the above officers and W. J. Holland, B. W. Council, J. T. Rawles and Dr. A. T. Sheffield. The new organization will purchase the holdings of the Bell Telephone Company in that place and will maintain a local exchange and extend the lines to the surrounding country.

Cashmere, Wash.—The Mission Creek Telephone and Electric Power Company has been incorporated with a capital stock of $5,000 by A. C. Jones, E. F. Stowell and others.

Ephrata, Wash.—The Green Valley Telephone Company has been incorporated with a capital stock of $5,000 by A. W. Owen, J. Pierce and others.

Husum, Wash.—The Husum Telephone Company was recently formed at this place by some 50 subscribers to the White Salmon Valley Telephone Company, who were dissatisfied with the service rendered by this company. It is proposed to construct a line to Underwood, connecting with that system.

Cascade, Wis.—The Cascade Telephone Company has been incorporated with a capital stock of $3,000 by J. E. Hoffman, J. H. Schleuter and A. Suemmich.

Ellsworth, Wis.—Articles of incorporation have been filed for the Farmers' Consolidated Telephone Company with a capital stock of $25,000.

Shawano, Wis.—The Red River Telephone Company has been incorporated with a capital stock of $5,000 by John T. Callahan, Joseph Lieg and A. J. Stieger.

Aniwa, Wis.—Articles of incorporation have been filed for the Aniwa Telephone Company with a capital stock of $6,000. The incorporators are A. J. Peterson, George M. Goldring and J. A. Manser.

Elkins, W. Va.—The Chenoweth Valley Telephone Company has been incorporated with a capital stock of $5,000 by C. W. Ward, Fred Chenoweth and W. A. Hart.

FINANCIAL ITEMS.

Willows, Cal.—At the annual meeting of the Glenn County Telephone Company the capital stock of the company was increased from $100,000 to $200,000. The following directors were elected: C. L. Donohue and H. J. Barceloux, of Willows; M. Ossinbriggen, of Butte City; Andrew Kaiser, of Germantown, and George Ellis, of Elk Creek. The officers are: President, H. J. Barceloux; secretary, A. S. Lindstrom; manager, W. H. Travis. The company is planning to enter Sacramento, San Francisco, Oakland and Berkeley over the wires of the Postal Telegraph Company.

Stamford, Conn.—The charter of the Porto Rico General Telephone Company has been amended increasing its capital stock from $130,000 to $500,000.

Carlyle, Ill.—The capital stock of the Citizens' Telephone Company will be increased from $15,000 to $35,000.

Chicago, Ill.—Receivers for the Interstate Telephone and Telegraph Company have been authorized to sell 5,539 shares of unissued stock for the purpose of completing extension work.

Cutler, Ind.—To the end that it may extend and improve its system, the Cutler Co-operative Telephone Company has increased its capital stock $6,000. George W. Shanklin is president and Frank A. Mitchell, secretary.

Nicholasville, Ky.—The Jessamine Home Telephone Company has increased its capital stock to $15,000.

Louisville, Ky.—The Cumberland Telephone and Telegraph Company has filed amended articles with the county clerk, which provide for the conversion of the stock of the company, which at present consists of 196,801½ shares of common stock of the par value of $100, into preferred stock at the option of the stockholders.

Emporia, Kans.—The public utilities commission has granted the Emporia Telephone Company permission to issue $100,000 in bonds for the purpose of making improvements and for refunding bonds. The bonds issued will bear 6 per cent interest.

Portland, Mich.—The capital stock of the Portland Telephone Company has been increased from $5,000 to $15,000.

Owosso, Mich.—The Clinton County Telephone Company will increase its capital stock from $20,000 to $50,000.

Meade, Kans.—The State Utilities Commission has granted the Meade Telephone Company permission to issue bonds to the amount of $20,000, proceeds to be used for improvements.

Lincoln, Neb.—The Lincoln Telephone and Telegraph Company has filed an amendment increasing its capital stock to $2,500,000 with an issue of special preferred stock of $7,500,000. The fee in connection with the filing of this instrument is said to have been $3,805.75.

Blue Hill, Neb.—The Glenwood Telephone Company has been granted permission to issue $38,875 of stock to effect a reorganization.

Aurora, Neb.—The Hamilton County Telephone Association has been given permission to issue $1,000 worth of stock for the purpose of constructing farm lines, making the total capital stock $37,000.

DELPHOS, O.—The capital stock of the Delphos Home Telephone Company has been increased from $30,000 to $50,000.

DELPHOS, O.—The Delphos Home Telephone Company has been granted permission by the service board to issue $20,000 new stock, which may be sold for the purpose of making needed improvements and extensions.

ROCKFORD, O.—The Rockford Telephone Company has increased its capital stock from $5,000 to $10,000.

PITTSTON, PA.—The Commonwealth Telephone Company has increased its capital stock from $200,000 to $500,000.

ONO, PA.—The Ono and Lebanon Rural Telephone Company has amended its charter increasing its capital stock from $5,000 to $20,000.

LEESBURG, VA.—The Leesburg Telephone Company has increased its capital stock from $10,000 to $25,000.

LYNN, WIS.—The capital stock of the Lynn Telephone Company has been increased to $2,080.

FRANCHISES ASKED AND GRANTED.

PHOENIX, ARIZ.—The Overland Telephone Company has been granted a twenty-five year franchise.

LONG BEACH, CAL.—The Pacific Telephone and Telegraph Company has been granted a renewal of its franchise which expired in May, 1911.

WAYCROSS, GA.—C. C. Buchana, Jr., has made application for a 20-year franchise to operate a telephone system in this place and promises to begin work on the system within 90 days after same is granted.

CHILLICOTHE, ILL.—The People's Telephone Company has been granted a franchise by the city council.

QUINCY, ILL.—The city council has granted a renewal of a franchise to the Bell Telephone Company for twenty-five years. The company is to pay $10,000 on signing of contract and is required to give double the number of free telephones required in a former agreement. All lines must be put underground in the fire limits, and the company waives all claims to an unexpired seventy-one year franchise.

ORESTES, IND.—The Orestes Telephone Company has obtained a twenty-year franchise in this place and will at once install its service. The company operates a number of rural telephones in the county.

FRANKLIN, KY.—The Farmers' Mutual Telephone Company has secured a franchise in this place and will proceed at once to install an all-cable plant and will connect with other mutual companies in adjoining counties and the Central Home Telephone Company of Louisville.

HILL CITY, MINN.—A telephone franchise has been granted to Bery Wideman.

WINONA, MINN.—An ordinance granting the Tri-State Telephone Company a long distance franchise in Winona has been agreed to by the aldermen and the representatives of the company. The ordinance provides for ten public long distance stations in the city. The council has also ordered the installation of a police patrol telephone system with ten stations, to cost $2,000.

HOLLISTER, MO.—R. Whitlock, of Palmyra, Ill., has been granted a ten-year telephone franchise in this place. Mr. Whitlock recently disposed of his telephone interests in Palmyra and will install a new system in this place as rapidly as the work can be done.

GARDNERVILLE, NEV.—The United Farmers' Telephone and Telegraph Company has applied to the Board of County Commissioners for a franchise to construct lines in certain parts of the county.

DAWSON, N. D.—The Farmers' Telephone Company of this place has been granted permission by the county board to operate a telephone system.

UNDERWOOD, N. D.—The McLean County Farmers' Telephone Company has been granted a franchise.

DENISON, TEX.—The Southwestern Telephone and Telegraph Company has been granted a franchise in this city.

DAYTON, WASH.—The Mount Vernon Telephone Company has been granted permission to enter this city.

RATES.

WINNIPEG, MAN., CAN.—Telephone rates in Manitoba have recently been readjusted, as they were found to be too low in some cases and too high in others. The rate in Winnipeg is four dollars a month for a private telephone, or if the subscriber prefers, he may pay a dollar and a half a month and two cents per call for all over thirty; four dollars a month for a business telephone, with the privilege of making one hundred calls during that time; excess calls two cents each. Outside of Winnipeg the rate varies according to the number of subscribers on the exchange. The system is owned by the province and operated under a commission.

POLO, ILL.—An effort is being made by the business men of this place who are patrons of the Ogle County Telephone Company to have the company reduce its rates from $2.00 to $1.50 per month, the same as the rate of the Mutual company.

DETROIT, MICH.—An ordinance was recently introduced providing for the reduction of local telephone rates 50 per cent for the average user, elimination of the distinction between residence and business telephones, and establishment of a rate of $3.30 a month and one cent each for outgoing messages in excess of 200 per month on single-party lines, with no limit on incoming.

ST. JOSEPH, MO.—According to a decision reached by the public utilities commission, the Missouri and Kansas Telephone Company will be required to reduce its rates from $60 to $48 for business telephones and from $30 to $24 for residence telephones. No change will be made for party lines.

PUYALLUP, WASH.—The council has made an informal demand upon the officers of the Home Telephone Company that a rate of $2.00 a month be specified for business telephones in the city in exchange for the granting to the company of a new franchise in place of the old franchise technically forfeited by the company. The present rate of $3.00 was declared excessive.

MISCELLANEOUS.

MONTGOMERY, ALA.—At the annual meeting of the stockholders of the Home Telephone Company the following directors were elected: E. L. Barber, Toledo; W. H. Bryant and Adam Glass, Mobile; W. P. Bowman, New York; Lee C. Handy, Cleveland. During the year the company spent $15,000 in improving its system.

BIRMINGHAM, ALA.—In accordance with the agreement with the city commission on the telephone rate compromise, the Southern Bell Telephone and Telegraph Company is preparing to make extensive improvements and additions to its plant in the city which contemplate an expenditure of more than $233,000. District Manager D. F. Turmbull will have charge of the work.

BISHOP, CAL.—The Southern Sierras Power Company will construct a private telephone line from this city to San Bernardino, along the company's transmission line now in building, which, it is said, will be the longest private line in existence.

GREENVILLE, CAL.—An exchange will be installed in this place by the California and Northern Telephone and Telegraph Company.

BAKERSFIELD, CAL.—The Lost Hills Telephone Company will spend in the neighborhood of $25,000 in improving and extending its system in the Lost Hills district. Richard Hastings is manager of the company.

LOS ANGELES, CAL.—The City Council is planning for the installation of a fire-alarm and police-signal system which will comprise about 1,000 fire-alarm boxes and 500 police-signal boxes, extending over the entire city and the estimated cost is $500,000.

SAN FRANCISCO, CAL.—The Board of Supervisors has appropriated $12,400 for the installation of a police-signal system in the business district.

SASKATOON, SASK., CAN.—The government proposes to install an automatic telephone exchange at a cost of $250,000.

GALESBURG, ILL.—At the annual meeting of the Galesburg Union Telephone Company the following directors were elected: B. F. Arnold, Nels M. Burgland, G. B. Churchill, C. E. Marsh, W. E. Phillips, D. L. Peterson, W. A. Robbins, E. P. Robson, W. E. Terry, Robert Robson and Lafayette Weinberg. Reports showed the company to be in a good condition, a good increase having been made during 1911. The company now has 4,872 telephones in service.

JOSLIN, ILL.—At the annual meeting of the Crescent Telephone Company the following officers were elected: President, William Whiteside, Joslin; vice-president, A. McCall, Erie; treasurer, A. Hansen, Hillsdale; secretary, A. A. Matthews, Erie; directors, William Farber, Port Byron; Peter Kelly, Hampton; D. W. Mumma, Fred Filmer, D. A. Camp, Kirk Shannon, A. J. Jahns.

TOWER HILL, ILL.—The exchange of the Pana and Christian County Telephone Company in this place has been taken over by the Tower Hill Mutual Telephone Company.

ABINGDON, ILL.—The Abingdon Mutual Telephone Company has elected the following officers: President, Len Cutler; vice-president, Grant Dechant; secretary and treasurer, O. Latimer; directors, Chauncey Famulener, George Burnside and the above officers.

HENRY, ILL.—The city council has passed an ordinance requiring all telephone and electric wires to be placed underground.

MACOMB, ILL.—The Macomb Telephone Company, recently granted a franchise in this place, has organized by electing the following officers: President, E. S. Slusher; vice-president, A. A. Messmore; secretary and treasurer, C. K. Todd; directors, the above officers and Henry Argenbright, Leroy Yeast, J. H. Hungate and Chas. Tairwalt.

TAMPICO, ILL.—At the annual meeting of the directors of the Tampico Farmers' Mutual Telephone Company it was voted to purchase a new switchboard for the Rock Falls exchange. The affairs of the company are in excellent conditions, as shown by a surplus of $2,410.79 in the hands of the treasurer.

CLINTON, ILL.—At the annual meeting of the National Telephone Company B. F. Wasson was elected president; V. R. Wasson, secretary-treasurer, and C. H. Coffman, general manager.

HAMMOND, ILL.—The Hammond Mutual Telephone Company has been consolidated with the Atwood Telephone Company.

ROCKFORD, ILL.—At the annual meeting of the Home Telephone Company the following officers were elected: President, T. M. Ellis, vice-president, Roscoe S. Chapman; treasurer, J. H. Camlin; treasurer, Frank Worthington; directors, the above officers and E. E. Bartlett, Dewitt C. Taylor, B. Duffield, W. G. Sharp and C. L. Miller. Reports showed the past year to have been a prosperous one, 442 more telephones having been installed than during the previous year. Plans have been developed for increasing long-distance connections. The Illinois Telephone and Telegraph Company was recently organized to make long-distance extensions over the middle west, the officers being the same as the Home company.

FORT WAYNE, IND.—The Home Telephone Company has elected the following officers: President, Charles H. Bash; vice-president, John B. Reuss; secretary and general manager, W. L. Moellering; treasurer, Max B. Fisher; assistant secretary, Frank E. Bohn.

MONROEVILLE, IND.—The following officers have been elected by the Monroeville Home Telephone Company: President, S. E. Fentzer; vice-president, Joseph Clem; secretary-treasurer, G. E. Snake; directors, the above officers and William Shamerloh and A. C. Crawford.

ELKHART, IND.—The Home Telephone Company recently elected the following officers: President, I. W. Short; vice-president, H. B. Sykes; secretary and treasurer, W. L. Shoots; directors, the above officers and E. D. Ziesel, P. R. Judkins, W. C. Peters, Jas. A. Arthur and Chas. W. Miller.

CRESTON, IA.—The Creston Mutual Telephone Company has elected officers as follows: President, J. C. Sullivan; vice-president, Scott Skinner; secretary and general manager, George E. Atkinson; treasurer, W. H. Brady.

STACYVILLE, IA.—The Stacyville telephone exchange, heretofore owned by the Eureka Telephone Company, has been purchased by Peter Halback for a consideration of $15,000.

ELDRIDGE, IA.—The annual election of the Eldridge Mutual Telephone Company resulted as follows: President, E. M. Burmeister; vice-president, August S. Lamp; secretary, M. H. Calderwood; treasurer, H. W. Bruhn; directors, Rudolph Moeller, Fred Krambeck, Frank Keppy, John Hansen and Peter J. Meinert.

ALBION, IA.—At the annual meeting of the Albion Mutual Telephone Company officers were elected as follows: President, Ford Thompson; vice-president, Martin Graham; secretary, R. W. Hill; treasurer, Jason Moffatt; directors, W. H. Allen, H. H. Wilcox, C. Kroner and John Lunstrum.

COUNCIL BLUFFS, IA.—The Independent Telephone Company has elected the following officers for the ensuing year: President, Gen. G. M. Dodge; vice-president, E. H. Merriam; secretary, C. D. Parmalee; treasurer, T. G. Turner; directors, C. E. Yost, G. H. Pratt, G. E. McFarland and W. A. Pixley, of Omaha; C. G. Saunders and the above officers.

MCPHERSON, KANS.—The McPherson Telephone Company has elected officers as follows: President, J. E. Wright; vice-president, John R. Wright; secretary and treasurer, L. C. Criner; directors, the above officers and Richard Miller, V. F. Roseberg, G. W. Allison and D. F. Kuns.

BETHANY, MO.—The Farmers' Telephone Company has elected officers as follows: President, John Lilli, Ridgway; vice-president, John Gates, Bethany; secretary, Carton S. Winslow; treasurer, W. W. Taggart, both of Bethany.

SAGINAW, MICH.—The Valley Home Telephone Company has elected the following directors: R. B. McPherson, Howell; J. C. McCabe, Bay City; James P. Gibbs, Saginaw; Geo. R. Wedthoff, Bay City; Gerritt Ward, Alma; C. B. Trask, Saginaw; L. G. Beckwith, Bay City; N. W. Struble, Shepard; John J. Steel, Saginaw; Herman G. Spring, Union, and O. J. Morton, Bay City. The report of the secretary showed that the company's business has increased during the year and that its affairs were in good financial condition.

MAYSVILLE, MO.—The executive committee of the DeKalb County Mutual Telephone Company recently recommended that the company be reorganized with a capital stock of $25,000, with 1,000 shares of $25 each.

MONROE CITY, MO.—The Farmers' and Merchants Telephone Company has elected the following directors: A. Lee Ely, Jas. Smith, Wm. Hamilton, W. H. Elliott, J. H. Bell, A. C. Moyers, T. A. Wilson, John Kendrick, I. L. Owens, W. J. Rouse, and John Yates.

EAST SYRACUSE, N. Y.—The Business Men's Protective Association has taken up the proposition of an independent telephone system in this city and if the proposed increase in rates is put into effect it is said the line will be installed.

ALBANY, N. Y.—The New York Telephone Company has acquired control of the following telephone companies in the state: Commercial Union Telegraph Company, operating at Troy, Glens Falls, Saratoga, Lake George and other points; Albany Home Telephone Company and its subsidiary company, the West Shore Home Telephone Company, Catskill; the Cohoes-Waterford Home Telephone Company, operating at Cohoes and Waterford; The Rensselaer Home Telephone Company, Rensselaer; Schenectady Home Telephone Company; Citizens' Telephone Company, Kingston; Dutchess County Telephone Company, Poughkeepsie; and the Independent Union Telephone Company, the toll line connecting these plants. The total number of telephones involved is approximately 26,000 and the consideration was in the neighborhood of $3,000,000.

SUMMIT, N. Y.—The Summit Telephone Company has elected the following officers: President, Charles O. Evans; vice-president, Miles H. Crapses; secretary, George M. Proper; financial secretary, Daniel Boynton; treasurer, David Gray.

EATON, O.—The Tri-County Telephone Association, composed of companies in Preble, Warren, Montgomery and Miami counties, has elected the following officers: President, D. C. Mills, New Lebanon; vice-president, Lawrence Fudge, Farmersville; treasurer, George Fortney, New Paris; secretary, Charles E. Cox, Eaton.

LAKEVIEW, ORE.—The Lakeview and Pine Creek Telephone Company has acquired the rural lines at Bunting, Dent, Chandler and Moss and will construct a new system in the Goose River Valley. E. C. Thurston is president of the company.

MT. HOOD, ORE.—The Mt. Hood Telephone Company has elected the following officers: President, T. A. Sammis; vice-president, E. Hendershot; secretary-treasurer, S. E. Blunt.

BEAVER, PA.—The Beaver County Telephone Company has taken over the Raccoon Telephone Company, a sub-licensee of the Bell Telephone Company.

CANADIAN, TEX.—The Canadian Long Distance Telephone Company has been purchased by the Southeastern Telephone Company and the same will be greatly improved.

TULETA, TEX.—The Tuleta Rural Telephone Company contemplates extending its lines.

WACO, TEX.—The Home Telephone Company and the Brazos Valley Telephone Company have been consolidated under the name of the Brazos Valley Telegraph and Telephone Company. The company has filed a blanket mortgage on its property in the sum of $1,000,000 to the Union Trust Company of St. Louis, as trustee. The company is arranging to issue $1,000,000 of bonds, the proceeds to be used in extensions and improvements. The officers of the company are as follows: President, Edward Rotan; secretary, M. H. Lane; superintendent and manager, J. B. Earle.

NEWPORT, WASH.—The Newport Telephone Company has been purchased by the Interstate Telephone Company for a consideration of $25,000. It is said the new owners will make improvements in the system and connect with its long distance lines.

TACOMA, WASH.—At an auction held under the Federal Court authority, the holdings of the Home Telephone Company were purchased by the Sunset Telephone Company for $550,000.

MOUNDSVILLE, W. VA.—At the annual meeting of the Farmers' Mutual Telephone Company the following officers were elected: President, M. B. Griffith, Pleasant Valley; vice-president, A. Lowe, Glen Easton; secretary, J. T. McCreary, Viola; treasurer, J. J. Lutz, Rosbys Rock; executive committee, T. T. Bonar, Glen Easton; J. J. Cain, Pleasant Valley; Frank Phillips, Rock Lick; J. R. Harris, Rock Lick.

VICTORIA, B. C.—The British Columbia Telephone Company contemplates the installation of a submarine cable from Victoria to Bellingham, Wash., via San Juan, Shaw and Rosario Straits.

SASKATOON, SASK., CAN.—The government proposes to install an automatic telephone exchange at a cost of $25,000, work to begin at once.